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A HANDBOOK OF THE THEORY AND PRACTICE OF MEDICINE.

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BY

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TO

SIR WILLIAM JENNER, BART.,

K.C.B., D.C.L., M.D., F.R.S.,

This Volume is Dedicated

AS A

TOKEN OF ESTEEM AND ADMIRATION, AND IN GRATEFUL REMEMBRANCE OF MANY ACTS OF KINDNESS,

BY

THE AUTHOR.

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PREFACE.

THIS work is intended mainly for the use of students, and its object is to present in one volume such information with regard to the Principles and Practice of Medicine, as shall be sufficient not only to enable them to prepare for the various examinations which they may have to undergo, but also to guide them in acquiring that clinical knowledge which can alone properly fit them for assuming the active duties of their profession. It is hoped, however, that its contents may be found of some service to those who are already busily engaged in general practice, and who have but few opportunities for the perusal of the larger treatises, or of the various special monographs.

The extreme difficulty of accomplishing this task satisfactorily must be obvious to any one who is acquainted with the present extent of medical literature. Indeed, it is almost impossible to condense into a book of moderate dimensions a concise and at the same time clear and readable account of what a work on medicine ought to contain. It has been found necessary to extend this volume beyond the limits originally intended; nevertheless, it is hoped that whatever may be its shortcomings (and of these I feel deeply conscious there are many), it may not altogether fail in fulfilling the purpose for which it was undertaken.

I have ventured to introduce some important innovations on the method usually adopted in manuals on medicine, to two of which particular attention may be directed. 1st. Before describing the individual diseases of the several organs or systems, an outline has been given of the clinical phenomena which indicate a morbid condition of each, and of any modes of "physical examination" employed in their investigation, while the principal symptoms are considered in detail. This portion of the work has been printed in smaller type; but it must be distinctly understood *that this does not imply a minor degree of importance*, as compared with that of other parts. 2dly. An endeavor has been made to generalize the remarks on diagnosis, prognosis, and treatment, so far as was practicable. It remains to be seen whether this course, which has appeared to me, from my own observation of disease and my experience as a clinical teacher, to possess certain evident advantages, will meet with approval or not.

With regard to the sources of information which have been made use of in preparing the contents of this volume, it has been my aim to consult the works of all the standard authorities on each subject, as well as the current literature, and to incorporate what I could gather therefrom with my own practical knowledge, derived from a tolerably extensive and varied experience of hospital and other kinds of practice. The limited space at my command has prevented me from acknowledging individually the authors from whom I have quoted, to the extent which I could have wished, and I therefore now express my deep obligation to all those gentlemen of whose writings I have availed myself.

My acknowledgments are due to my colleague Dr. Gowers, and to Mr. Reeves, Assistant-Surgeon to the London Hospital, for valuable help. To Mr. Walter Rigden, Resident Medical Officer, and Mr. John Tweedy, Clinical Assistant to the Skin Department at University College Hospital, I owe special thanks, as without their kind assistance it would have been impossible for me, in consequence of a sudden failure in health, to have brought out the work at this time. The former gentleman has written nearly the whole of Chapter LXVI, and has superintended the passage through the press of several of the later chapters, as well as of the Index; while to the latter I am indebted for the entire chapter on Skin Diseases. I also desire to express my obligation to the many professional friends who have encouraged me in what has been a very arduous undertaking; and to my publisher, Mr. Lewis, for the kindness and courtesy which he has manifested throughout.

I am fully aware that in submitting a treatise of this kind to the criticism of my professional brethren, I have no right to expect any lenient consideration on their part. At the same time, I cannot but express the hope that they will not judge it by too high a standard, and will be prepared to recognize any merit which it may happen to possess.

THE AUTHOR.

53 HARLEY STREET, LONDON,
October 1st, 1873.

TABLE OF CONTENTS.

SECTION I.

CHAPTER I.

PAGE
INTRODUCTION, ... 17

CHAPTER II.

CAUSATION OF DISEASE, OR ETIOLOGY, ... 21

CHAPTER III.

SYMPTOMATOLOGY, OR SEMEIOLOGY, ETC., . . . 31

SECTION II.

CHAPTER I.

HYPERÆMIA, OR CONGESTION, ... 42

CHAPTER II.

DROPSY, ... 47

CHAPTER III.

HEMORRHAGE, ... 57

CHAPTER IV.

INFLAMMATION, ... 63

CHAPTER V.

PAGE
HYPERTROPHY—ATROPHY, ... 82

CHAPTER VI.

DEGENERATIONS, ... 86

CHAPTER VII.

FEVER, OR PYREXIA, ... 101

SECTION III.

PART I.

CHAPTER I.

ON CONTAGION—EPIDEMICS, ... 118

CHAPTER II.

ON THE CLINICAL INVESTIGATION OF ACUTE FEBRILE CASES, ... 132

CHAPTER III.

CONTINUED FEVERS, ... 138

CHAPTER IV.

SCARLATINA—SCARLET FEVER, ... 175

CHAPTER V.

RUBEOLA—MORBILLI—MEASLES, ... 185

CHAPTER VI.

VARIOLA—SMALL-POX, ... 191

CHAPTER VII.

PAGE
Erysipelas—The Rose—St. Anthony's Fire, . . 213

CHAPTER VIII.

Diphtheria, ... 220

CHAPTER IX.

Glanders and Farcy—Equinia, ... 228

CHAPTER X.

Yellow Fever, ... 234

CHAPTER XI.

On Malaria, or Marsh-miasm, ... 239

CHAPTER XII.

Rheumatism, ... 248

CHAPTER XIII.

Gout—Podagra, ... 264

CHAPTER XIV.

Scorbutus—Scurvy, ... 275

CHAPTER XV.

Rachitis—Rickets, ... 283

CHAPTER XVI.

Constitutional Syphilis, ... 291

CHAPTER XVII.

Tuberculosis and Scrofulosis, ... 298

CHAPTER XVIII.

PAGE
CARCINOMA—CANCER, ... 306

PART II.

CHAPTER I.

AFFECTIONS OF THE MOUTH AND TONGUE, ... 311

CHAPTER II.

AFFECTIONS OF THE SALIVARY GLANDS, . . . 321

CHAPTER III.

AFFECTIONS OF THE THROAT, ... 325

CHAPTER IV.

AFFECTIONS OF THE ŒSOPHAGUS, ... 341

CHAPTER V.

PHYSICAL EXAMINATION OF THE CHEST, . . . 349

CHAPTER VI.

DISEASES OF THE RESPIRATORY ORGANS, ETC., . . 390

CHAPTER VII.

HOOPING-COUGH AND INFLUENZA, ... 395

CHAPTER VIII.

AFFECTIONS OF THE LARYNX AND TRACHEA, . . 404

CHAPTER IX.

DISEASES OF THE LUNGS AND PLEURÆ, . . . 427

CHAPTER X.

PAGE
Pneumonia—Inflammation of the Lungs, . . . 441

CHAPTER XI.

Pulmonary Congestion—Œdema—Hemorrhage, . 457

CHAPTER XII.

Emphysema of the Lungs, ... 463

CHAPTER XIII.

Atelectasis—Apneumatosis—Pulmonary Collapse—Pulmonary Compression—Carnification, . . 478

CHAPTER XIV.

Phthisis—Pulmonary Consumption, ... 481

CHAPTER XV.

Cancer of the Lungs, ... 507

CHAPTER XVI.

Pleurisy—Inflammation of the Pleura, . . . 510

CHAPTER XVII.

Hydrothorax—Dropsy of the Pleura, . . . 520

CHAPTER XVIII.

General Diagnosis of Affections of the Lungs and Pleuræ, ... 524

CHAPTER XIX.

Diseases of the Circulatory Organs, . . . 530

CHAPTER XX.

PAGE
ACUTE INFLAMMATIONS OF THE HEART AND PERICARDIUM, ... 548

CHAPTER XXI.

CHRONIC AFFECTIONS OF THE HEART AND PERICARDIUM, 558

CHAPTER XXII.

ON CERTAIN RARE CARDIAC AFFECTIONS, . . . 592

CHAPTER XXIII.

DISEASES OF BLOODVESSELS, ... 596

CHAPTER XXIV.

MEDIASTINAL TUMORS, ... 607

CHAPTER XXV.

ON CERTAIN ABNORMAL CONDITIONS OF THE BLOOD, . 609

CHAPTER XXVI.

THROMBOSIS AND EMBOLISM, ... 615

CHAPTER XXVII.

DISEASES OF THE ABDOMEN, ... 621

CHAPTER XXVIII.

DISEASES OF THE PERITONEUM, ... 627

CHAPTER XXIX.

DISEASES OF THE STOMACH AND INTESTINES, . . . 643

CHAPTER XXX.

PAGE
Acute Gastric Catarrh—Acute Gastritis, . . . 665

CHAPTER XXXI.

Ulcer of the Stomach, ... 671

CHAPTER XXXII.

Cancer of the Stomach, ... 675

CHAPTER XXXIII.

General Diagnosis of Chronic Gastric Affections, 680

CHAPTER XXXIV.

Inflammation of the Intestines—Intestinal or Enteric Catarrh—Enteritis—Duodenitis—Typhlitis and Perityphlitis, ... 689

CHAPTER XXXV.

Epidemic, Asiatic, Algid, or Malignant Cholera—Cholera Morbus, ... 695

CHAPTER XXXVI.

Intestinal New Formations and Ulcerations, . 720

CHAPTER XXXVII.

Intestinal Obstruction, ... 726

CHAPTER XXXVIII.

Intestinal Worms—Helminthiasis, ... 737

CHAPTER XXXIX.

Diseases of the Liver and its Appendages, . . 747

CHAPTER XL.

PAGE
CONGESTION OF THE LIVER—HYPERÆMIA, ... 755

CHAPTER XLI.

CHRONIC DISEASES OF THE LIVER, ... 765

CHAPTER XLII.

AFFECTIONS OF THE GALL-BLADDER, ... 781

CHAPTER XLIII.

GALLSTONES—BILIARY CALCULI—CHOLELITHIASIS, . 783

CHAPTER XLIV.

GENERAL DIAGNOSIS OF CHRONIC LIVER AFFECTIONS, . 787

CHAPTER XLV.

DISEASES OF THE SPLEEN, ... 796

CHAPTER XLVI.

DISEASES OF THE PANCREAS, ... 804

CHAPTER XLVII.

DISEASE OF THE SUPRARENAL CAPSULES — ADDISON'S DISEASE, ... 808

CHAPTER XLVIII.

ABDOMINAL ANEURISM, ... 811

CHAPTER XLIX.

DISEASES OF THE URINARY ORGANS, ... 814

CHAPTER L.

PAGE
DIABETES MELLITUS—GLYCOSURIA, ... 831

CHAPTER LI.

RENAL CONGESTION OR HYPERÆMIA, ... 839

CHAPTER LII.

BRIGHT'S DISEASE, ... 845

CHAPTER LIII.

CERTAIN EXCEPTIONAL FORMS OF URINARY DISEASE, . 859

CHAPTER LIV.

URINARY CALCULUS AND GRAVEL, ... 863

CHAPTER LV.

GENERAL DIAGNOSIS OF URINARY AFFECTIONS, . . 866

CHAPTER LVI.

DISEASES OF THE ABSORBENT GLANDS, ... 876

CHAPTER LVII.

DISEASES OF THE THYROID GLAND—BRONCHOCELE—GOITRE, ... 881

CHAPTER LVIII.

DISEASES OF THE NERVOUS SYSTEM, ... 884

CHAPTER LIX.

ON CERTAIN FUNCTIONAL NERVOUS DISEASES, . . 916

CHAPTER LX.

PAGE
ON CONDITIONS RESULTING FROM THE ENTRANCE OF CERTAIN POISONS INTO THE SYSTEM; ALSO THE PHENOMENA OF SUNSTROKE, ... 940

CHAPTER LXI.

ORGANIC DISEASES OF THE BRAIN AND ITS MEMBRANES, 951

CHAPTER LXII.

APOPLECTIC DISEASES, ... 963

CHAPTER LXIII.

CHRONIC DISEASES OF THE BRAIN AND ITS MEMBRANES—CHRONIC MENINGITIS, ... 978

CHAPTER LXIV.

DISEASES OF THE SPINAL CORD AND ITS MEMBRANES, . 986

CHAPTER LXV.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF ORGANIC NERVOUS DISEASES, ... 994

CHAPTER LXVI.

RARER DISEASES OF THE NERVOUS SYSTEM, . . . 1006

CHAPTER LXVII.

DISEASES OF THE SKIN, ... 1014

ERRATUM.

Page 486, read paragraph beginning "ANATOMICAL CHARACTERS" below the heading "ACUTE PHTHISIS," p. 487.

THEORY AND PRACTICE OF MEDICINE.

SECTION I.

CHAPTER I.

INTRODUCTION.

THE study of medicine has ultimately two chief objects in view, viz., 1st, the successful treatment of the various deviations from health which are met with in the human body; and, 2dly, the prevention of their occurrence, or, in other words, the maintenance of a normal healthy condition of the different organs and tissues, as regards both their structure and functions. In order to carry these out satisfactorily, a special and systematic course of training is absolutely essential, by means of which a knowledge is gained of the different diseased conditions, as regards their nature, and the evidences of their existence; the ability to discriminate between them is developed; while at the same time a familiarity is acquired with the causes which are capable of producing them, and with the appropriate remedies to be made use of in their treatment.

This process of training cannot, however, be properly entered upon, unless the student has become previously acquainted with the preliminary subjects of a medical education, more especially anatomy and physiology. Further, it is very important that much of the information obtained during this preliminary education should be firmly retained in the memory, seeing that it is at this time it can be turned to practical account, and without it, many things which come under observation would be quite unin-

4. With respect to the *present attack*, it is necessary to inquire about its supposed cause, duration, mode of invasion, symptoms, and course, up to the time that the patient is seen.

The examination thus far, if properly conducted, is of much service in the determination of the *causes* which have led to the diseased condition, and also frequently gives considerable aid in making out its nature. In order to do this, however, it is further requisite:

5. To ascertain the *present state* of the patient by personal examination, and to note the existing symptoms and signs. In doing this, it is essential for the student to be systematic in his investigation, inquiring first into the more *general symptoms*, and then examining each individual organ or system in turn, in the ways to be hereafter described. It is, therefore, needful to have a clear knowledge of the symptoms and signs which each organ or part is capable of giving rise to, before these can be properly investigated.

Having finished this process of examination, it is then usually possible to come to a correct conclusion as to the seat and nature of the affection present, or *to make a diagnosis*. At the same time an opinion may be arrived at, as to the probable progress and issue of the case, and a *prognosis* given. Founded on the diagnosis, the next step is to proceed to *treatment*, if anything can be done. Afterwards, it is necessary to observe the progress of the case, noting any changes or complications which may occur, as well as its *duration* and *termination*. Finally, if death happens, the post-mortem examination must be conducted in the same systematic manner as that during life, and a record kept of the appearances and conditions met with.

CHAPTER II.

CAUSATION OF DISEASE, OR ETIOLOGY.

THIS is a subject of the utmost importance, and demands far more attention than is often given to it. No case ought to be looked upon as properly investigated, until every effort has been made to find out what influences have been at work in bringing about the morbid condition present.

To be able to do this implies not only a general knowledge of the causes which are capable of producing disease, but also a more minute acquaintance with the relation between special causes and special diseases, and, so far as this can be obtained, an intelligent comprehension of the manner in which the various influences produce their injurious effects. This is the chief object in view when taking the general and previous history of a patient, and the family history, and the degree of difficulty in arriving at a satisfactory conclusion on this matter varies very considerably; in some instances, the etiology is evident at once, and one or more causes may be definitely and positively fixed upon; in others, very careful and prolonged inquiry has to be made, and then, perhaps, without any substantial result. In this search after causes, it is necessary sometimes to be careful in taking the statements of patients, and to guard against coming to too hasty and unfounded conclusions, thereby attributing any diseased condition present to a wrong source.

It will be readily understood that the same cause may produce many and very different diseases, and *vice versâ*; but with regard to the various classes of disorders, it will be found that each is brought about most commonly by a certain limited number of causes, which act more or less directly on the organ or part affected, and therefore when any particular organ is evidently involved, though it is desirable to get a "general history" always, yet it is especially necessary to inquire into those conditions which are known to be most capable of influencing it injuriously. These remarks may be illustrated by the relation which exists between "taking cold" and lung affections; between improper food or drink and derangements of the alimentary canal; or between excessive mental labor and brain diseases. Some diseases can only be originated by one, definite, *specific* cause, and to such the term "specific" is applied.

The value of an acquaintance with the etiology of disease consists: 1st. In that it often gives material aid in diagnosis. 2d. It not uncommonly influences the prognosis considerably, the same morbid condition differing much in its gravity according to its cause. 3d. In the majority of individual cases, it gives most useful indications as regards treatment. And, 4th. Above all, it enables us to take measures for the prevention of disease, and against its extension, and thus to maintain the health of the general community.

Different terms have been used to classify causes, and often with much ambiguity of meaning. The primary division generally made is into *proximate* and *remote*. The *proximate* cause is really the actual condition of any organ or part which leads to the symptoms present, and it is synonymous with *pathological cause*. *Remote* causes are further divided into *predisposing* and *exciting*, some of the latter being named *determining*.

Predisposing causes include those which bring about a condition of the system generally, or of some organ or part, rendering it more prone to be affected by the *exciting*, these being the immediate and direct agents in the production of some morbid deviation as to function or structure, which constitutes disease. The term *predisposition* is used to express the state favorable to the action of an exciting cause, and the individual in whom it exists is said to be *predisposed*. It is not to be supposed, however, that there is a distinct and definite limit between these two classes of causes; what may only *predispose* at one time, may *excite* at another, and especially is this true, when there are several injurious influences, acting together, and for a long period. Further, a so-called "predisposing cause" may only render one organ more liable to be attacked than another, as is seen in the influence of age upon the seat of tubercle or cancer.

Having given these explanations, we are now in a position to consider the causes of disease somewhat in detail, and it will be most convenient to do so by classifying them into:

1. *Intrinsic*, or those depending upon the individual, in whom they are inherent or acquired.

2. *Extrinsic*, or those due to accidental, and chiefly external influences.

As far as practicable, it will be pointed out which predispose to, and which excite, disease.

1. INTRINSIC. *a. Age.*—A number of diseases are more prone to occur at certain periods of life than at others; while some tend to affect different organs at different ages, or even special tissues in the same organ. This may be explained often by the nutritive and functional activity of the system generally, or of certain organs, being much greater at one time of life than at another, and therefore, the liability to either general or local disease is more marked. Changes of structure also, in the direction of decay, not unfrequently account for the predisposition due to age, as for example, degeneration of the vessels in old age, making them brittle, and thus leading to apoplexy. Young children and persons advanced in years, are very subject to ailments of various kinds.

b. Sex.—Females are more prone to some affections than males, and *vice versâ*, while others are necessarily limited to either sex. This depends on the different conditions of certain organs in the two classes of persons, and the length of outlets (*e. g.*, urethra); on the functions peculiar to each sex; on the dissimilarity in habits, occupation, &c.; on the difference in constitutional strength and vigor; or on certain peculiarities in the nervous system, women being much more sensitive and excitable, and therefore more liable to various nervous disorders. A larger number of males die on the whole than of females.

c. General or Constitutional Condition. State of Health, &c.—A state of debility predisposes to many diseases, and this may either be congenital or brought about by other causes. Possibly the opposite condition of robustness and vigor may increase the liability to others. The condition of the blood has also much influence, complaints often arising from its being poor and watery (anæmic); or, on the other hand, from this fluid being in excess, and too rich in quality (plethoric). *Previous diseases*, especially of an acute nature, frequently predispose to or excite others, *e. g.*, the various fevers, whooping-cough, lung affections, rheumatism, syphilis, &c. A *neglected symptom*, such as cough, may be productive of much harm. Habitual neglect in attending to certain natural functions, especially those connected with the alimentary canal, very commonly leads to injurious results. The existence of *structural changes*, of a morbid character, in organs or tissues, may readily induce or predispose to further lesions, or may give rise to diseased conditions in other parts. Thus a fatty or calcified state of the arteries, renders them liable to be easily ruptured; cardiac diseases often excite lung affections, and *vice versâ;* or one disease of the lung or heart may lead to another. Other causes of disease, which may be alluded to here, are direct loss of blood; excessive or long-continued discharges; or the sudden suppression of an habitual discharge, of a chronic skin disease, or of some local development of a constitutional disorder, such as gout.

d. Temperament.—Four temperaments are described, viz., the sanguineous, lymphatic, bilious, and nervous, each supposed to indicate a tendency to certain special diseases. The information on this point is very contradictory, and not of much practical value.

e. Idiosyncrasy.—Some individuals are affected injuriously by certain things, which do not at all influence others in the same way; this is the case with articles of diet, as fish, mushrooms, &c., or medicines, such as iodide of potassium, quinine, &c. To this individual peculiarity, the term "idiosyncrasy" is applied, and it probably has an influence in predisposing to some diseases.

f. Hereditary Predisposition.—Several diseases are supposed to be capable of transmission from parent to offspring, and with regard to some, this is unquestionably true, but the evidence is not so clear with respect to others. Those affections or conditions usually considered to be hereditary are:

(i.) Certain constitutional or blood diseases, viz., gout, rheumatism, diabetes, scrofula, tuberculosis, cancer, syphilis.

(ii.) Some affections of the nervous system, viz., epilepsy, chorea, insanity, hypochondriasis, neuralgia, apoplexy, paralysis.

(iii.) Physical deformities, as well as deficiencies in connection with the special senses, such as blindness or deafness.

(iv.) Early degenerations, either local or general, which are shown in degeneration of the vessels, fatty changes of organs, loss of the elasticity of the skin, premature grayness or baldness, loss of teeth, &c. They need not be identical in different generations.

(v.) Some skin diseases, especially psoriasis and lepra.

(vi.) Emphysema and asthma (?).

(vii.) Gravel and urinary calculus.

(viii.) Hæmorrhoids (?).

The conditions in the parent and child need not be similar, but may be merely related, *e. g.*, epilepsy in the one, and insanity in the other. Again, some vicious habit in the parent may lead to disease in the offspring, *e. g.*, intemperance may originate certain nervous disorders. In some cases a constitutional disease in the parent may only cause the child to be weakly and delicate, which is true of syphilis sometimes.

The transmitted disease may actually develop itself in the fœtus in utero, being then congenital, or only after birth at some period or other; or it may lie dormant until brought out by an "exciting cause." In some cases it is supposed to pass over one generation, and appear in the next, this being called "Atavism."

Hereditary tendency to disease is unquestionably intensified by intermarriage of those suffering from the same affection, *e. g.*, phthisis; also by the marriage of those who are closely related, very young, or of very unequal ages.

The hereditary character of diseases is also sometimes shown in their occurrence at an earlier age than is usual. This is the case with gout, and perhaps asthma. Families occasionally seem extremely prone to be attacked by certain affections, and to have them with great severity, of which the infectious fevers afford instances.

It is with the view of determining the existence of "hereditary predisposition" of any kind, that inquiry into the family history is made. In conducting this, special attention must of course be paid to the parents, brothers, or sisters, and children; but the grandparents and collateral relatives, uncles, aunts, and cousins, must not be neglected. It may be necessary to look into not only particular diseases, but also the habitual state of health, ages when death occurred, and other points which an individual case might suggest.

g. Race.—There can be no doubt about the influence of race in increasing the liability to certain diseases, or the reverse. This is exemplified in the greater proneness of white than black people, to suffer from malarial fevers. The prevalence of some diseases, however, among particular races, may be explained by their habits and mode of living, and place of abode.

2. EXTRINSIC. *a. Depending on Surrounding Meteorological and other Conditions.*

(i.) *Atmosphere.*—The air we breathe necessarily must influence greatly the state of health, and it does so in the following ways. It may be impure, because it is not sufficiently changed by proper ventilation, and thus contains a large amount of the products of respiration, combustion, &c. Or it may be mixed with gases, not usually present, such as emanate from sewers, decomposing animal or vegetable matters, or which are given off in different manufactures. Suspended impurities are also often present, *e. g.*, dust, cotton, hair, wool, unconsumed carbon, fragments of metals, arsenic, and, probably, living organisms. It is frequently the vehicle for the transmission of specific poisons. The proportion of moisture which the air contains is important, whether this be excessive or deficient. Possibly its electrical condition, or the amount of ozone in it, may have some influence. And, lastly, the degree of pressure of the atmosphere may affect the health, as shown by the results which sometimes follow the ascent of a high mountain. Atmospheric influences may act either as predisposing or exciting causes.

(ii.) *Temperature.*—Excessive or long-continued heat or cold, either local or general, will lead to disease. The general effects are exemplified in sunstroke, and in the condition of the system produced by the intense cold of the Arctic regions. A sudden change from one extreme to the other is often very injurious, and so is exposure to cold winds. Even in warm weather a "chill" may produce disease, and it is frequently due to the patient's own neglect, for instance with regard to changing wet clothes, or being exposed to a draught, when heated and perspiring.

(iii.) *Amount of Light and Insolation.*—When this is habitually deficient, unquestionably an injurious effect is produced. The amount and kind of artificial light employed has also some influence.

(iv.) *Soil.*—The modes in which this exercises its influence are chiefly, by the amount of vegetable matter which it contains capable of being decomposed; by its degree of, and permeability to, moisture; by its effect on the heat and light of the sun, whether absorptive or reflective; and by its chemical composition, which affects the composition of the water and air in the neighborhood. Wherever there is much moisture, with vegetable materials, and a certain temperature, such as exist in marshy soil, malaria are almost always prevalent. Clayey soils are very moist and cold. Most sandy and gravelly soils are healthy, unless they contain vegetable matter. Those containing much lime and magnesia are said to lead to goitre and renal calculus. The breaking up of soil is often attended with evil consequences.

(v.) *Sewage.*—This is a very common source of disease, on account of the deleterious gases given off from it, as well as the decomposing organic matter, and, not uncommonly, certain specific agents in the production of disease, which it contains. It is particularly hurtful through getting into the water which is used for drinking purposes.

b. Causes due to the Social Condition and Habits of the Individual, and certain other Accidental Influences.

(i.) *Food.*—This may be deficient in quantity, or of improper quality, either habitually, or only temporarily, and may thus promote or induce disease, especially in children. On the other hand, it may be excessive, or of too rich quality. Irregularity as regards meals, and the habit of bolting food, or imperfect mastication from any cause, often act injuriously.

(ii.) *Drink.*—Intemperance in the use of *alcoholic stimulants* is a fertile source of disease, and it is always well to bear this in mind, when investigating any doubtful case. Spirits are the worst, especially if taken at frequent intervals, strong, or only slightly diluted, and on an empty stomach. It must be borne in mind also, that many of the compounds sold as beer, spirits, &c., contain most noxious adulterations. *Water*, or the want of it, is a very prolific source of disease. When insufficiently supplied, for purposes of cleanliness, &c., serious results often ensue. The *habit of drinking large quantities of water*, especially during meals, frequently does harm. Again, water may be the direct means of conveying various morbific agents into the system, such as noxious gases, certain salts, poisonous metals, the ova of worms, animal organic matters, especially the excretions, vegetable matters in a state of decomposition, and specific poisons. *Tea-drinking* in excess very often leads to disease, and its bad effects are seen daily in all classes of society. *Milk* does harm if decomposed or adulterated, and it has been proved to be not unfrequently the medium by which specific poisons enter the system.

(iii.) Other habits, such as smoking, snuff-taking, the use of narcotics, as opium, &c., or excessive indulgence in hot condiments, not uncommonly are injurious.

(iv.) *Clothing.*—This may be *insufficient*, either habitually, or only from time to time, or certain regions may be improperly protected. Thus infants and young children are frequently completely exposed about the lower part of the body, and no doubt "take cold" as a consequence. The chest is also in many persons insufficiently covered. On the other hand, individuals may be *overclad*, especially children. Clothing may also do harm by being *too tight*, and exerting pressure, as in the case of tight stays or belts. The custom of *not changing clothes* when they are wet, is very dangerous.

(v.) *Want of cleanliness*, domestic and personal, often induces disease. So may the use of certain substances which irritate the skin.

(vi.) *Amount of Labor and Exercise.*—Many persons suffer as the result of excessive and prolonged labor, as an habitual thing, or only at intervals. On the contrary, others lead a sedentary life, and take no exercise. Various occupations furnish instances of both these hygienic errors, which lead to disease, though they are often voluntarily indulged in, independently of occupation, especially the leading of a sedentary life.

(vii.) *Mental Causes.*—Among these may be specially mentioned excessive intellectual effort or study, particularly if combined with deficient sleep, or much anxiety; all violent or depressing emotions, such as grief, sudden joy, deep anxiety of mind, or severe and sudden fright. They may either predispose to or excite diseases, especially those connected with the nervous system.

(viii.) *Mechanical Causes.*—These constitute a very important class, especially in exciting or determining some morbid condition, owing to the direct injury or irritation which they produce. The chief of them are external violence, long-continued pressure, overexertion and straining, the long maintenance of a certain position, and the irritation of foreign bodies. Among the last may be particularly mentioned, calculi, accumulations of fæces, parasitic animals and plants, and substances inhaled in small particles into the respiratory organs. Occupations often act injuriously in some of these ways. A *mechanical* cause sometimes leads to the local development of a constitutional disease; thus pressure or injury is said to determine the formation of cancer in a part.

(ix.) Venereal excesses, masturbation, too early, or frequent sensual excitement, unquestionably often produce much mischief.

The causes which have thus far been considered are usually more or less combined in any individual case, and it is in order to ascertain which of them are acting, that we inquire as to the residence, occupation, social condition, and habits of a patient, as well as his previous health, and that of his family. On an extensive scale, their influence is seen in the different conditions of health and disease in civilized and uncivilized countries; in different nations, and in the same country, under varying modifications of government, civilization, religion, &c.; in large towns and country places, as well as in different towns or districts, and certain parts of them; in mountainous regions and low, confined valleys. Some of them also explain the influence of climate and season in the production of disease.

ON CERTAIN SPECIAL CAUSES OF DISEASE.

There are certain agents which excite disease not yet considered which require separate notice. They are chiefly of the nature o poisons of various kinds, and produce effects which are more o less definite and constant.

1. *Chemical Poisonous Substances, chiefly Inorganic, especiall Metals.*—The effect of various chemical poisons upon the syste are sufficiently obvious, and require no comment. It is necessar however, to call special attention to the fact that some of thes may act injuriously upon the system, as the result of occupatio or in some other way, without their being directly administere as poisons or medicines. This is especially the case as regard lead, and those who use this metal in their employment are ver often affected by it. Mercury, phosphorus, arsenic, copper, gol and other substances produce their effects, either local or genera in the same way. There are other channels by which lead ma be introduced into the system, which will be pointed out later o With respect to arsenic, it is important to observe that it may given off as a fine powder, from certain green papers used f papering rooms, and then be taken up from the atmosphere individuals, giving rise to symptoms of poisoning.

2. *Causes originating in the Vegetable Kingdom.*—(i.) Many the ordinary poisons are derived from this source, such as opiu (ii.) *Parasitic plants,* growing in various structures of the bod are frequent causes of disease. This is specially the case wi regard to skin affections. The presence of certain fungi in t stomach is supposed occasionally to give rise to vomiting. (ii *Decomposing vegetable matter* often does much harm. It is esp cially injurious by producing *malarial or miasmatic poisons,* prevalent in marshy districts. These give rise particularly certain peculiar fevers, ague, yellow fever, &c., but also to so nervous disorders and other complaints. The different poi connected with malaria will be discussed in detail in a later p tion of this work. (iv.) It is believed by many that *contagion* due to low vegetable organisms.

3. *Causes originating in the Animal Kingdom.*—(i.) Certa

animals are venomous, and can inflict poisoned wounds, as is well known, *e. g.*, serpents. (ii.) Some animals are poisonous, if taken internally, such as cantharides. (iii.) *Parasites* derived from the animal kingdom very commonly set up morbid conditions. This may be illustrated by the various intestinal worms, and by the external parasites which infest the skin. (iv.) *Specific Contagious Poisons.*—These call for special notice, though they will not be treated of at present at any length. A number of very important diseases originate from the entrance into the system of certain specific poisons, which are transmitted from some other animal to man, or from one human being to another. This subject will call for detailed consideration hereafter, and now it will suffice to mention small-pox and scarlatina as examples of contagious maladies.

4. Some diseased conditions are due to the presence of a poison in the blood, which has been generated within the body, as the result of the perversion of the functions of digestion, assimilation, and nutrition. Gout furnishes an illustration, and once developed, the malady may be hereditarily transmitted.

CHAPTER III.

SYMPTOMATOLOGY, OR SEMEIOLOGY, ETC.

A "SYMPTOM" may be defined to be anything which in the living subject gives evidence of the existence of some diseased condition. Different terms are associated with symptoms which it is necessary to explain. They are named:

1. *General* or *constitutional*, and *local*, according as they affect the entire system, or some particular part.

2. *Objective* and *Subjective.*—The former include all symptoms which are evident to the senses of the observer; the latter, those which are only felt by the patient.

3. *Direct* or *Idiopathic* and *Indirect.*—These terms signify respectively, symptoms which are immediately associated with the

diseased part, and those connected with some remote part, the latter in some cases being called *sympathetic*. Thus vomiting is often present as a "sympathetic symptom" during the passage of a renal calculus.

4. *Premonitory* or *Precursory*.—Before the actual attack, symptoms may be present indicating more or less what is going to happen, and to these the above terms are applied.

5. The words *diagnostic*, *prognostic*, and *therapeutic*, sufficiently explain themselves, meaning those symptoms which indicate the nature of a disease, its prognosis, or its treatment. *Pathognomonic* is the term applied to such symptoms as belong to a particular disease, and no other, and are therefore absolutely characteristic of it. Much confusion has arisen in the use of the word *sign*. It ought not to be employed as synonymous with "symptom" in general, which it often is, for a "sign" really means a symptom which points to the nature of a disease; in short, it is a *diagnostic* or *pathognomonic symptom*.

Physical signs are, strictly speaking, merely *objective symptoms*, though only such of these as are elicited by certain methods of "physical examination" are recognized by some as *physical signs*.

Modes of Examination for Symptoms.—As has been insisted upon in the introductory chapter, it is necessary for students at first, when examining patients, to go through a systematic and complete inquiry with regard to each organ, but in ordinary practice this cannot be done, nor is it, as a rule, required; but at all times method is desirable, and the following hints may, perhaps, be of some value in indicating the mode of investigation which should usually be employed:

1. Make a general superficial examination of the patient, especially by inspection, but also with the aid of the other senses, by which much information may be gained, and a strong hint is often afforded as to the morbid condition present, in some instances, indeed, a positive diagnosis being practicable in this way. During this cursory examination we notice especially: *a*. The *general condition*, as to corpulence, emaciation, state of the muscles, &c., as well as the temperament, apparent age, and any striking evidences of constitutional disease. *b*. The *posture*, indicating, for instance, great debility and helplessness, difficulty

in breathing, or restlessness. *c.* The *countenance.* This is very important, for there is no doubt that a diagnosis may often be made from carefully studying the face of a patient. Thus we may observe an *abnormal color,* such as the pallor of anæmia or chlorosis, the malar flush of "hectic fever," the dusky or livid hue of some cardiac and pulmonary diseases, the white and pasty aspect of certain forms of kidney disease, or the yellow color of jaundice. This change in color is often well seen on the conjunctiva and mucous membrane of the lips and mouth. It may be accompanied with puffiness, or enlargement of the small blood-vessels. The *expression* is also frequently very characteristic, as indicating severe illness, pain, anxiety, or morbid indifference, but especially as pointing to certain forms of insanity and other nervous disorders, such as mania, imbecility, epilepsy, hysteria, or *delirium tremens.* Again the *features* may give evidence of paralysis, or muscular twitchings or convulsions, as in chorea or epilepsy; or squinting, or alteration in the size of the pupils may be observed. *d.* The *state of the surface generally,* as to color, presence of eruptions, dryness, or moisture, apparent temperature, as well as the existence of any subcutaneous dropsy, either general or local. *e.* Signs of *dyspnœa,* which may be evident in the aspect of the patient, or in the efforts made to breathe. *f.* Symptoms referable to the nervous system. Some of these have been alluded to, and among others may be mentioned delirium, unconsciousness, various forms of spasmodic movements or paralysis.

2. Having completed this general examination, an endeavor should be made to find out the prominent symptoms complained of, and the length of time they have existed, in order to have a clue to the organ affected, and to determine whether the disease is acute or chronic. This information may be generally obtained from the patient or friends, especially with the aid of a few leading questions. It must not be forgotten, however, that sometimes symptoms seem to point to one organ when another is actually diseased; *e. g.,* in some brain diseases vomiting may be the chief symptom.

3. The seat of the mischief being thus indicated in the majority of cases, it is then requisite first to examine *fully* into the symptoms associated with the organ or part apparently involved, and

next into those connected with organs most nearly related to that which is diseased, for it must be remembered that different systems in the body influence each other materially. After this it is desirable to inquire, in a general way, into the condition of other functions not immediately involved, and in all cases it is particularly requisite to feel the pulse, to ascertain the state of the digestive organs, especially observing the tongue, and in females to find out whether the menstrual functions are performed properly. It is also advisable to get into the habit of *always examining the urine*, at all events in any obscure case, and to find out the condition of the heart and lungs by "physical examination," whenever opportunity offers.

The methods by which the required information is obtained are, by *systematic questioning*, and by *objective* or *physical examination*. The former discloses to us the *subjective* symptoms, the latter reveals whatever can be made evident to the senses of the observer, and is therefore far more to be relied on. Indeed it is necessary to remark, that the statements of patients must often be received very cautiously, and no opportunity ought to be lost of verifying them or otherwise by personal observation, if this is practicable. For instance, the amount of blood brought up in "spitting of blood" is frequently greatly exaggerated, and even the very fact itself.

Physical examination properly includes all modes of investigation by which objective symptoms are made out, but by many it is limited in its meaning to certain special methods of examination, such as that applied to the chest or abdomen. It is of the utmost importance, as not unfrequently by its help alone are we able to make out the nature of a complaint. The different external senses are employed, which are aided by the use of various instruments, and by chemical and microscopic research.

In the majority of cases a number of symptoms are grouped together, but sometimes one becomes so prominent as to be popularly looked upon as the disease itself, and gives the main indication for treatment, *e. g.*, dropsy, or hemorrhage. Under such circumstances, however, it is imperative that the actual cause of the condition present should be carefully sought for, and it often points to the direction in which this inquiry should be made.

The *symptoms* which are associated with each individual organ or part, will be enumerated in their several sections, before the particular diseases are described.

There is one, however, common to all, which may be alluded to here, viz., *pain*. Pain is complained of very frequently, and has often to be made the subject of special inquiry, though this requires particular care, as this symptom is so liable to be exaggerated, and it may be merely sympathetic. The points we have to ascertain about it are: *a.* If it is acute or chronic as regards its onset and duration; *b.* Its precise situation and extent, and the structure in which it is apparently seated; *c.* Its intensity and special character; *d.* Whether it is constant, or only occasional, remittent, intermittent, or paroxymal; *e.* The effects of *pressure* upon it, whether showing tenderness, or giving relief; *f.* The manner in which it is influenced by various acts, such as movement, coughing, vomiting, taking food, &c., these of course differing according to the structure in which the pain is supposed to originate.

Mode of Invasion, Course and Duration of a Disease.—It is important in all cases to attend to these points. The varieties which are met with in these respects are as follows: 1. The attack may be quite *sudden*, as in the case of apoplexy, syncope, many hemorrhages, &c., the subsequent course necessarily differing in different instances, a rapidly fatal termination often occurring. 2. Frequently the illness is *acute*, coming on rapidly, though often preceded by premonitory symptoms; being severe in its character, and of brief duration. Many acute affections run a tolerably definite course, as a rule, for instance, the eruptive fevers, or pneumonia, and it is necessary to be acquainted with their natural history; but irregularities are frequently observed, owing to a number of disturbing influences being at work, and in many diseases, there are distinct *varieties*. A chronic disease is generally brought to a close by some acute attack. When the onset is less rapid, and the symptoms less severe, the case is said to be *subacute*. 3. The great majority of cases are *chronic*, the symptoms setting in gradually, not being severe, and the progress being slow and protracted. A chronic disease may, however, be the sequel of an acute attack, or may terminate in one. 4. Some diseases are characterized by periodical exacerbations, which come on at regular or irregular intervals, the patient being comparatively, or even quite well in the meantime. Such complaints are chronic in their progress, but acute or sudden as regards the onset and intensity of the attacks, having an intermittent course. Epilepsy, ague, and asthma will serve as illustrations.

Complications and Sequelæ.—During the course of, or subsequent to, some diseases, others of a secondary nature are apt to arise, either from the same cause, or as the direct result of the primary affection, or as an accidental and independent event. These are termed complications or sequelæ, and are particularly observed in connection with acute diseases, such as fevers. It is necessary to be acquainted with the complications which are liable to arise in various disorders, in order to take measures to prevent their occurrence.

Terminations.—In a clinical point of view a case may terminate in—1. *Complete recovery,* which is usually gradual, the patient passing through a period of convalescence, of greater or less duration, but may be sudden or very rapid. 2. *Incomplete recovery,* either a condition of general bad health remaining, or some organ or part being permanently altered in its structure and functions. In fact a more or less *chronic* state of disease remaining behind. 3. *Death.*—This event may take place suddenly, rapidly, or slowly. As a rule it is a complex process, the functions of all the chief vital organs being more or less involved; but often the signs of approaching dissolution are associated more especially with the *heart, respiratory organs,* or *brain.* Death beginning at the heart is said to be by *syncope,* and it may be due either to a want of a proper supply of blood to the heart, produced rapidly or slowly (*anæmia*), or to a loss of contractile power in this organ from mechanical interference with its action, structural changes in its walls, or disturbance in connection with its nerves (*asthenia*). In some instances, such as starvation, these two modes of death are combined. Death, commencing at the lungs, is by *suffocation,* or *asphyxia.* This may depend upon the air inspired being unfit to aerate the blood, or for various reasons, not entering the lungs in sufficient quantity (*apnœa*), or upon a stoppage of the flow of blood through these organs, as occurs in cases when a clot suddenly obstructs the pulmonary artery. Death beginning at the brain is said to be by *coma*, being characterized by a primary state of stupor or insensibility, which, however, is soon followed by interference with the respiratory functions. These various modes of death are merely mentioned at present, as the symptoms which indicate their approach will demand a full description when treating of the diseases of the several organs.

Diagnosis.—It is obvious that to arrive at a *correct diagnosis* ought to be the primary object of the physician in any individual case, as otherwise no rational treatment can be adopted, and it will be impossible to give any satisfactory prognosis. Any one who is merely satisfied with ascertaining the chief symptoms present, without interpreting their meaning, falls far short of his duty, and cannot properly fulfil the functions of a medical practitioner. In making a *diagnosis*, the questions to be considered are these: 1. Is there anything wrong at all? (for it must be borne in mind that not a few complain when there is no actual disease existing, especially among those belonging to the class of "malingerers"). 2. If there is any morbid condition present, is it of an acute or chronic nature? 3. Does it affect the *general system*, or is it localized in any *special* organ or organs? 4. If the disease is *general*, what is its nature? 5. If seated in some *organ*, is this merely disturbed in its functions, or is there any positive organic and structural change? 6. If the latter, it is necessary to determine the nature of the structural alteration, the part and extent of the organ which is involved, and the actual stage of the disease. For example, in phthisis it is requisite to make out whether the disease is tubercular or not; how much of the lung or lungs may be involved; and if there is merely consolidation, or if this has softened or broken down into cavities.

The elements which may be available in assisting towards a diagnosis are as follows: 1. The *previous history* of the patient, both general and with regard to the former state of health, as well as the *family history*. 2. The history of the existing illness, as to its duration, cause, and mode of invasion. 3. The actual phenomena or symptoms present, especially those of an *objective* character. 4. The progress, duration, and termination of the case. 5. The results of treatment.

We endeavor to make a diagnosis by a process of mental reasoning, and the degree of difficulty which is experienced in so doing varies greatly. In some cases it is quite easy to come to a correct conclusion at once, from some one or more "pathognomonic" symptoms; in others every point has to be carefully weighed, especially in discriminating between diseases which resemble each other, and even then it may be impossible to give a positive opinion, though by watching the course of the case, and observing the effects of the treatment, doubts and difficulties are often cleared up. In some cases a diagnosis is only arrived at by *exclusion*, and occasionally it cannot be made at all. Now and then *one* symptom is so marked, that practically the matter of diagnosis comes to be, to find out its cause; *e. g.*, *ascites*, or *jaundice*. Should one organ be found to be diseased, it must be remembered that others may be affected also, and hence, in order to make the *entire diagnosis* these must not be overlooked; it must also be borne in mind that some diseases present several *varieties*, and this must be taken into account in making a diagnosis.

Prognosis.—To "give a prognosis" is often a matter of much difficulty, and requires the greatest caution and tact. It implies, of course, a knowledge of the nature of the disease under consideration, and an acquaintance with its natural history, course, duration, complications, terminations, &c., as well as with the influence of various accidental circumstances upon it, either depending upon the patient, such as age, constitution, &c., or due to external circumstances. In many cases a positive opinion may be tendered at once, but if any doubt exists, the matter calls for very careful consideration, and everything like rashness should be avoided. It is always well to be as explicit as possible to the friends, pointing out all dangers which are liable to arise, and setting clearly before them the probabilities of the case; but it is sometimes not advisable to tell the patient, should the prognosis be unfavorable. If it is uncertain, it is better to err, in my opinion, in the direction of being too favorable than the opposite, as this encourages perseverance in regard to treatment.

The questions which have to be answered with respect to prognosis are: 1. Whether the case is likely to terminate in death or recovery. 2. Its probable duration in the event of either termination, and in case of death whether it may be sudden. 3. In the event of recovery, whether this will be complete, or if some morbid condition is liable to be left behind, especially of an organic nature. 4. When certain slight symptoms are present, it may be necessary to determine whether they are not signs of something more serious which is going to happen, *e. g.*, numbness, or limited paralysis may be premonitory of some grave organic affection of the *brain.*

Treatment.—It has been the fashion of late rather to disparage treatment, and to look upon it as of very little use, especially as regards the employment of medicines. If properly conducted, however, there can be no doubt that great benefit will result from treatment, and it appears far more desirable that our authorities should endeavor to propagate the true principles upon which it ought to be founded, rather than to condemn it altogether, speaking as if the physician were quite helpless in combating with disease, and had nothing to do but stand idly by and watch its course.

The objects which have to be kept in view in treatment may be stated as follows: 1. To *cure* the patient as soon as possible, restoring the various organs to their normal condition, and not leaving any structural changes behind. This is termed "*curative treatment,*" and is a *reality,* and not a myth. 2. In some cases we possess no means of directly curing, but we have, as it were, to guide the progress of a malady, which must run a certain course, towards a favorable termination, only actively interfering when untoward circumstances arise, our object being to *avert death,* and prevent permanent injury to health. This may be illustrated by the treatment of most fevers. 3. Unfortunately in many instances death is inevitable, and then the aim of treatment should be to *prolong life,* and to make the condition of the patient as comfortable as possible. 4. Frequently our measures have to be directed against *symptoms,* to relieve or remove which is the principal object. The result may be merely *palliative,* or sometimes in a sense *curative.* For instance, the removal of ascites and other forms of dropsy may practically cure a patient, in so far that he is able for many years to follow the ordinary avocations of life, although the organic disease which leads to the dropsy remains permanently. I would add, however, that a symptom should never be relieved at the expense of the general disease; for example, it is sometimes not advisable to stop *cough*. 5. *Preventive treatment* is of the deepest importance. It includes attention to the general health of an individual, so as to obviate any tendency to disease; the prevention of the extension of a disease in the same person, or to other individuals, and guarding against possible complications; the warding off of habitual attacks, such as those of acute dyspepsia, asthma, or epileptic fits; and the *rooting out* of various maladies, especially of constitutional disorders from the members of a family, and of contagious diseases from the midst of communities. 6. In some instances our treatment can only consist in *warning* the patient against doing things which may produce injurious consequences, and warding off everything that can lead to harm, *e. g.*, in certain cardiac diseases.

In treating an individual case, it is always requisite to consider the indications which it affords, and thus have some definite object in view. These are derived from: 1. The nature, seat, and stage of the disease. 2. The *causes* which have led to it. 3. The condition of the patient as regards age, constitution, &c., as well as the surrounding circumstances. 4. The *symptoms* present, which may either point to the measures to be adopted, or, on the other hand, may *contraindicate* a certain treatment which should be otherwise followed. 5. The state of the chief organs of the body. This often influences treatment materially, and hence the usefulness of making it a rule to ascertain what the condition of the heart, lungs, and kidneys is.

Treatment is of three kinds, *therapeutic*, *dietetic*, and *hygienic*, and each of these require careful attention. By *therapeutic* treatment is meant the use of medicines, and there is no question that by their proper employment we can do much good. In some instances we possess drugs which have undoubtedly a specific curative action upon certain diseases, and it is to be hoped that, as the result of the valuable investigations which are now being made with regard to the action of medicines, many more specifics may be discovered. As a rule, however, we do not know of special remedies for the cure of a disease, and then we have to use them in various combinations, according to certain principles, by which much benefit may be obtained.

Dietetic treatment is of the most essential service, and ought always to receive the greatest attention; indeed not uncommonly it is the only thing needed. It includes not only directions as to *the nature of the food* to be taken, but also as to the quantity, intervals, and other matters. In many cases it is advisable to make a personal examination of food, and see that it is of the proper kind; for instance, in the case of beef tea. The use of *alcoholic stimulants* always calls for most careful consideration.

Hygienic treatment is also exceedingly valuable. It includes attention to various matters, such as the place of residence and its hygienic conditions, habits of life, clothing, exercise, change of air and climate, &c. In *acute cases*, especially fevers, it is imperative on the practitioner to look personally into all questions connected with the sick-room, even of apparently minor importance, but especially as to *ventilation* and *cleanliness*, the *condition of the bed*, the *removal of excessive curtains*, or *carpets*, and the nursing. In short, to attend in every way to the comfort and well-being of the patient.

External applications are often very useful in treatment.

It will readily be understood that the management of a case is frequently beset with difficulties, and requires the exercise of much thought, discretion, and *common sense.* It is necessary to guard against falling into a mere routine treatment, or to rely entirely on the experience and teaching of others, and always to try to study every case on its own merits, thus endeavoring to reason the matter out, and make the treatment *rational;* at the same time it is not advisable to be always changing from one remedy to another, and running after every new and fashionable drug which appears. If a medicine has been proved by long experience to cure a certain disease, even though we are ignorant as to how it acts, and our treatment is *empirical*, there is no reason why we should discard it, unless ample evidence is afforded that a more powerful agent has been discovered.

SECTION II.

In the present section it is proposed to consider certain morbid conditions which come under "general pathology," of which it is desirable to have a comprehensive knowledge before studying them in connection with special diseases.

CHAPTER I.

HYPERÆMIA, OR CONGESTION.

By these terms is meant the presence of an excessive amount of blood in a part. According to its cause, and to the vessels in which the accumulation chiefly occurs, the hyperæmia is said to be *Active*, or *arterial; Mechanical*, or *venous; Passive*, or *capillary.*

I. *Active or Arterial.*—"Determination of Blood."—In this form the arteries are chiefly affected, there being an increased afflux of blood through them, though usually too much blood also passes out by the veins, while the circulation is accelerated. The arteries are dilated, either because they cannot resist the ordinary pressure of the blood, or because this pressure becomes unusually great.

Symptoms and Effects.—The objective signs of "active congestion" are more or less bright redness, with turgescence and increased temperature. There may be visible pulsation in the arteries, as well as increased or altered secretion.

Ultimately the vessels may be so distended as to transude serum, or even to rupture, and give rise to hemorrhage. The subjective sensations are usually those of heat, fulness, and throbbing; or the functions of an organ may be materially affected, as is seen in the case of the nerve centres or lungs, severe symptoms being thus produced. If the congestion continues for a long period it may lead to permanent hypertrophy, or induration; the arteries also may become persistently dilated and thickened.

Causes.—1. Paralysis of the muscular coat of the arteries is the usual cause of active congestion, in consequence of which they yield to the normal pressure of the blood. It is well known physiologically that this coat is under the control of nerve fibres which pass from the spinal cord through the sympathetic, and these exercise an important influence on certain pathological processes, of which active congestion is one. The paralysis may be produced (*a*) by direct injury to the spinal cord in experiments, or as the result of disease. (*b*) By injury to the sympathetic trunk, of which the congestion resulting from the pressure of an aneurism upon the sympathetic in the neck is an example. (*c*) By reflex irritation through the sensory nerves, such as the congestion following the application of a mustard poultice, heat, or cold, or that ensuing upon the excessive use or increased activity of an organ, such as the eye or mammary gland. Under the same category may be mentioned that which often attends severe neuralgia. Probably many congestions of internal organs are produced in this way, and it is frequently the first step towards inflammation. (*d*) By causes acting through the brain, which may be illustrated by emotional blushing, and by the effects of some poisons.

2. The rapid withdrawal of external support from arteries may cause them to be dilated, and thus lead to congestion, this is seen in the effects of applying a cupping-glass to the surface, and thus removing the pressure of the air.

3. The internal pressure on the vessels may be increased either from an augmented force on the part of the heart, which principally affects the parts supplied by the vessels given off first, or from some channels being obliterated, and hence the blood has to find its way by those which are pervious, consequently distending them unduly.. The best illustration of the latter is the "collateral circulation," which is set up rapidly when a main artery is tied, or when it is suddenly blocked up in any way. Internal congestions are also often due to this cause, when they follow ex-

posure to cold, which leads to contraction of the small vessels of the skin, and thus the blood is, as it were, driven inwards. If the walls of the arteries are weakened from any cause, and are deficient in tone, they are more liable to become enlarged, but this does not appear sufficient in itself to determine active congestion.

II. *Mechanical or Venous.*—Here there is no excess of blood entering a part, but there is a difficulty in its passage through the veins, which, therefore, as well as the capillaries, become overfilled with dark blood, moving slowly and languidly. This is a very important form of congestion, and often leads to troublesome symptoms, calling for the attention of the physician.

Symptoms and Effects.—The objective signs, supposing the congestion to be superficial, are redness of a dull, dusky, purplish, or livid hue, with frequently evident distension of the capillaries and veins, the latter being often knotted; increase in bulk; and not uncommonly a lowering temperature. After a time the watery part of the blood transudes, containing some of the solid constituents, and thus "dropsy" is produced, which gives rise to greater enlargement, with a feeling of softness and pitting on pressure. In some cases there is a fibrinous exudation, which causes a firm and brawny feel, as may be seen after obstruction of the veins of the leg in phlegmasia dolens. When the kidneys are congested, albumen may be present in the urine, while, in connection with mucous surfaces, the same condition leads to a watery flux.

If the congestion is still more intense the coloring matter of the blood passes out, or the red corpuscles migrate through the walls of the vessels into the surrounding tissues, or finally the vessels may give way, and hemorrhage occur, as is observed in the case of varicose veins, and in the bleeding into the stomach or intestines which follows obstruction of the portal vein. This is especially apt to happen if the vessels are weakened, and it may take place into the substance of organs, as well as on free surfaces.

If the congestion is very great, rapidly produced, or long continued, it will lead to much interference with nutrition, which may end in ulceration or gangrene. An occasional formation of a "thrombus" occurs in connection with a congested vein, *e. g.*, in the portal vein in cirrhosis of the liver. With regard to organs or tissues, mechanical congestions will ultimately lead to their permanent enlargement or thickening, with the formation of a fibroid material, causing induration, stiffness, and loss of elastic and contractile power. The subjective symptoms will necessarily vary according to the part affected. Generally there is a sense of weight, or dull, heavy uneasiness, while the functions of the organ or structure are impaired to a greater or less degree. External parts, when the seat of venous congestion, often feel cold and numb.

Causes.—1. Some *mechanical interference* with the circulation of the blood through the veins is the ordinary cause of this form of congestion. This may be seated in the heart, and thus effect the entire systemic, or pulmonary circulation, or both, according to the precise locality of the impediment. It may only involve some special veins, or system of veins, such as the portal, or those of a limb, the obstruction being localized. The cause of the impediment may be either something within the vessels, such as a thrombus, or external pressure or constriction, as from a tumor, ligature, cirrhosis of the liver, &c.

2. Parts which are dependent are very prone to become congested from the mere influence of *gravitation*, and this is especially apt to occur if the tissues are relaxed and yielding, or the "*vis a tergo*" is deficient. Illustrations of this mode of origin are presented in the congestion of the veins of the legs which follows long standing, and in the formation of hæmorrhoids, as the result of sedentary occupations.

3. A diminution in the *vis a tergo* often gives rise to this form of hyperæmia, or assists other agencies in its production. The heart may be weakened in its action, or the arteries have lost their elasticity and contractility, owing to degeneration, and thus the forces which carry on the circulation are impaired, so that the blood cannot be driven through the veins. This is especially observed in old people.

III. *Passive or Capillary.*—Many include "passive" under mechanical congestions, but there is a distinction between them, though they are often associated. The capillaries are mainly involved, and the circulation is very languid in them, owing to a disturbance of the vital and nutritive relations between the elementary tissues and the blood. The conditions of a part thus congested are very similar to those met with in mechanical congestion. Atrophy of, and degenerative changes in, the tissues are liable to occur, while there is a proneness to low and asthenic forms of inflammation, tending to become chronic.

Causes.—1. A generally weak state of the system induces passive congestion, owing to the feeble activity of the circulation, and to the deficient nutrition and want of tone in the tissues. It especially affects parts which are dependent, or which are distant from the heart. Thus we see coldness and blueness of the extremities, nose and ears, under these circumstances. Also the hypostatic congestions, which are met with in various low fevers and debilitating diseases, come partly under this category.

2. Morbid conditions of the blood may cause passive hyperæmia. That which is present when the blood is improperly aerated is considered by some to be of this nature, and deficiency of fibrin also favors its occurrence.

3. If an organ or part is locally debilitated from any cause, and the functions of its tissues impaired, it is prone to become the seat of congestion. As illustrations of this may be mentioned that which is observed often in paralysed limbs, and that which follows excessive functional activity of an organ, whereby it has become exhausted. It also may succeed active congestion or inflammation, owing to the perverted relations thus set up between the blood and the tissues, as is frequently observed after tonsillitis.

Post-mortem Appearances.—Redness, varying in its tint and form according to the nature of the congestion, is the essential character of this morbid condition. In active congestion the color is bright red, and is usually in the form of a minute network, or it may appear uniform, or in points, when certain special structures are involved. It must be borne in mind, however, that there may have been active hyperæmia, and yet no redness be apparent after death, owing to the arteries having contracted and expelled the blood into the veins. Points of redness are seen sometimes, due to minute extravasations of blood.

The color of "venous congestion" is more or less dark-red, and may be blue or purple, while the veins are seen distended and forming a network.

Organs are often said to be congested in post-mortem descriptions, when this has not been the case in reality during life, but the blood has gravitated after death into dependent parts, and thus given rise to this appearance. Tissues also are subject to post-mortem staining by the coloring matter of the blood, which may simulate congestion. The results of congestion already described may be evident after death, such as dropsy, &c., and if long continued, considerable changes in the appearance and structure of organs may be visible. They frequently become gray or dark, owing to the presence of pigment derived from the coloring matter of the blood.

CHAPTER II.

DROPSY.

Dropsy is frequently described as a disease in itself, whereas in reality it is only a result of some general or local morbid condition, of which it often constitutes an important symptom. It consists in an accumulation of fluid which has escaped from the bloodvessels, either in the subcutaneous cellular tissue, in serous cavities, or in the cellular tissue of certain organs. It may occur in all these parts at the same time. Terms are used to express the site of the dropsy as follows: When it is seated in the subcutaneous cellular tissue, more or less generally, it is named *anasarca;* if localized, *œdema; hydrothorax* signifies accumulation in the pleura; *hydropericardium* in the pericardium; *ascites* in the peritoneum; *hydrocephalus* in the ventricles of the brain, or arachnoid cavity; *œdema* is the term applied to the dropsy of organs, *e. g.*, œdema of the lungs. If there is dropsy both of the cellular tissue and serous cavities, it is said to be *general.*

It must be mentioned that the name "dropsy" is commonly applied to certain morbid conditions, which have really no pathological relation to this symptom. These are known as "spurious dropsies," among which are included ovarian dropsy, which is a cystic disease of the ovary; accumulations of fluid in the interior of hollow organs, as the result of obstruction at an orifice, or inflammation, such as dropsy of the uterus (hydrometria), or of the gall-bladder; and certain serous effusions consequent upon inflammation, viz., effusion into the tunica vaginalis, hydrocele, and acute œdema of the glottis. Dropsy of the kidney (hydronephrosis) is either due to cystic disease, or, more frequently, to obstruction of the ureter, and consequent accumulation of urine and products of inflammation within the pelvis of the kidney, which gradually destroy this organ. These "spurious dropsies" will not be further alluded to at present.

Characters of Dropsical Fluid.—It is almost always thin and watery; either quite colorless or light yellow, as a rule, but sometimes tinged by the coloring matter of the blood or bile; clear and transparent, or rarely opalescent; varying in its specific gravity from 1008 to 1012 or 1014. It is usually alkaline in reaction, but occasionally neutral or slightly acid. Chemically it is allied to the serum of the blood, consisting of water, holding in solution albumen, alkaline and earthy salts, especially chlorides and extractive matters; but the proportion of these varies materially in different parts, and in different cases, especially the amount of albumen, and the composition is never identical with that of blood serum, the proportion of solids being much less. Fat, especially cholesterin and pigments, are sometimes present, and urea in one special form, viz., in renal dropsy.

Pathological Conditions producing Dropsy.—A dropsical accumulation is either the result of excessive effusion from the vessels, of deficient absorption, or of both combined; in short, the balance between exhalation and absorption is disturbed. It may be due to the following pathological conditions:

1. Overdistension of the vessels in the different forms of congestion, but especially in that dependent upon mechanical interference with the return of blood by the veins. This is one of the most common causes of dropsy, and is due both to an excessive escape of fluid from the vessels, and to their diminished power

of absorption. If there is obstruction to the circulation on the right side of the heart, more or less general dropsy will be produced in this way, beginning in the feet and ankles, and extending upwards. Considerable impediment in the lungs, such as is met with in many cases of acute bronchitis complicating emphysema, may produce the same effect. Obstruction on the left side of the heart will lead to œdema of the lungs, because the pulmonary vessels are overfilled. A local obstacle will cause limited dropsy. Thus interference with the circulation in the portal vein, or its ramifications, induces ascites; a clot in a vein of the arm or leg, or external pressure upon it, will give rise to œdema, confined to either extremity. Hydrocephalic accumulation is chiefly the result of pressure upon the small veins returning the blood from the ventricles of the brain. Gravitation necessarily influences much the seat of this form of dropsy, and may itself induce it, under certain conditions. Active congestion does not give rise to much dropsy as a rule, but it often causes œdema of a part.

2. A feeble and relaxed state of the vessels and tissues, in consequence of which the former readily yield, and allow transudation of fluid, often aids in the production of dropsy. Œdema of the feet and ankles, which is met with in many cases of general debility, is partly due to this cause, being assisted by the weakened cardiac action, which induces mechanical congestion.

3. An unhealthy condition of the blood may induce dropsy, especially if this fluid is very watery, deficient in albumen, or contains certain materials, such as urea. This cause materially aids often in the production of all kinds of dropsy, but it is the main influence in the causation of that attending anæmia, and is not unimportant in renal dropsy. This last variety is, however, partly due to the fact, that the kidneys do not get rid of the proper amount of water, and therefore the bloodvessels are overloaded with watery blood.

4. It is supposed by some eminent authorities, that dropsy depends chiefly on a withdrawal of the nervous influence in connection with the vessels, and experiments have been made to prove that so long as the nerves are intact, dropsy will not occur, even

if the veins are overdistended. There can be no question that the nervous system does exercise considerable control over the processes of exhalation and absorption, and will thus influence the occurrence of dropsy, but it is doubtful whether it occupies the important position attributed to it by some pathologists, as a cause of this symptom. Œdema not uncommonly sets in in paralyzed limbs.

5. A deficient power of absorption on the part of the lymphatics, has been considered to assist in giving rise to dropsy in some instances. Possibly this may exercise some influence in cardiac dropsy, as the chief lymph-ducts cannot empty themselves into the overloaded veins.

Causes.—Such being the pathological conditions with which dropsy may be associated, which are often more or less combined, its *causes* may be summoned up as follows:

1. Any cardiac disease that interferes with the circulation of the blood and leads to overloading of the veins and capillaries. The most important are affections of some of the orifices and valves, dilatation of the heart and degeneration of its walls, with consequent weak action. The heart may be pressed upon from the outside.

2. Affections of the lungs impeding the circulation. When an acute attack of bronchitis sets in in a case of emphysema, considerable dropsy may follow.

3. Diseases of the kidney, attended with a deficient elimination of water and urea, but allowing the escape of albumen in the urine. As a consequence the blood is impoverished and impure, and the vessels overdistended. It is requisite to make special mention of *scarlatina* as a cause of dropsy, which then generally depends upon an acute renal complication.

4. Diseases of the liver, or in its vicinity, causing obstruction to the portal circulation.

5. Exposure to cold and wet, or anything producing a chill. This is generally supposed to act by driving the blood inwards, and inducing active congestion, and the resulting dropsy is named *active* or *febrile*. It chiefly acts, however, by checking elimination by the skin, and at the same time inducing congestion of the kidneys, which therefore cannot perform their functions; thus the

vessels are overloaded, and the fluid portion of the blood transudes.

6. A local obstacle, in connection with some special vein, either from something within it. such as a clot, or from external pressure or constriction. From this cause, dropsy may be associated with pregnancy, ovarian and other tumors, aneurisms, &c., as well as with inflammation of the veins. It is often present in connection with varicose veins.

7. Gravitation of the blood into dependent parts. Long standing may lead to dropsy, especially if the blood is watery, and the tissues wanting in tone.

8. Anything that induces an anæmic state of the blood. In this way dropsy may be due to a want of proper diet, with other unfavorable hygienic conditions; hemorrhage or excessive discharges, either natural or unnatural; acute or chronic diseases which impoverish the blood, such as fevers, especially malarial, phthisis, cancer, splenic disease, scurvy, purpura, &c.

9. Certain causes leading to active congestion. Dropsy occasionally follows the sudden disappearance of skin diseases or discharges, and is then believed to result from active congestion. This also may occur from the irritation of some deposit, such as tubercle or cancer, and it accounts for the œdema often observed in the neighborhood of inflamed parts.

Symptoms and Course.—As a rule dropsy comes on more or less gradually, but sometimes its course is extremely rapid, and it may extend over the whole body in a few hours. Dependent parts, which are at the same time distant from the heart, are those in which usually it first appears, and is most abundant, or parts which are exposed, or where there is much loose cellular tissue. It is liable to vary with position, being necessarily influenced by gravitation. The appearances produced by anasarca or œdema are swelling, with pitting on pressure, the skin being generally pale, but sometimes congested. The degree of enlargement varies widely; it may be so great as to cause the skin to assume a tense, shining aspect, or even to burst or slough. The vitality of dropsical tissues is low, and hence they are very liable to low inflammations from slight irritation.

When fluid accumulates within serous cavities, it may or may not produce evident enlargement, but its presence can be made out in most cases, by certain "physical signs;" to be hereafter described. The subjective symptoms produced by dropsy of external parts are more or less discomfort and uneasiness, with a feeling of tightness or stiffness, but no actual pain or tenderness. It interferes mechanically with organs, and thus causes most serious disturbance of their functions. In certain parts it may lead to a rapidly fatal issue, as, for instance, in the case of œdema of the glottis, preventing the entrance of air into the lungs.

The general symptoms will necessarily vary according to the cause of the dropsy. If it is at all great in amount, the normal secretions are as a rule deficient in quantity.

Diagnosis.—It is usually not difficult to determine whether dropsy is present, but the chief point in diagnosis is to make out its cause. In order to ascertain this, of course it is necessary to observe what other symptoms are present, to make a careful investigation as to the general condition of the patient, and particularly as to the state of those organs, diseases of which are known to produce dropsy. Much help may, however, be derived from a consideration of certain facts with regard to the dropsy itself.

1. *Its place of Origin, Seat, and Extent.*—*Cardiac,* or *pulmonary* dropsy, begins in both feet and ankles, and extends upwards, ultimately becoming general. Ascites only occurs after the circulation through the liver has been for some time obstructed. *Renal* dropsy frequently starts in the face and upper part of the body, especially about the eyelids, where there is much loose cellular tissue, and in the hands, which are exposed. It may soon spread all over the body, and affect all the serous membranes, though not usually to a great extent. *Hepatic* dropsy is confined to the peritoneal cavity at first, because the portal system of veins is alone interfered with. The abdomen may become considerably distended, without there being any dropsy elsewhere, but in most cases after a while anasarca of the legs sets in, in consequence of pressure exercised by the fluid upon the vena cava inferior. Anasarca of the legs, and ascites may appear simultaneously should there be anything *pressing on the vena cava* before it passes through the diaphragm. *Anœmia* never causes much

dropsy, it is always limited to the subcutaneous tissues, and is usually only seen below the knees, or in the loose tissue of the eyelids. *Local* dropsy, as, for instance, when it is limited to one leg, always indicates some local cause. Rarely the superior cava is pressed upon, and dropsy of the upper part of the body is the consequence.

2. *Its Rate and Mode of Progress.*—Cardiac dropsy is generally slow and gradual in its progress, liable for a time to some variation, according to position, but ultimately this does not influence it much. It may increase rather quickly from some acute complication in connection with the lungs. That attending kidney disease, if acute, may be extremely rapid in its course, in some cases producing extreme enlargement of the body generally, and obliterating the features in a few hours. This is the only form of dropsy in which such a course can occur; it may also disappear in the same rapid manner. Hepatic dropsy usually progresses slowly and steadily. That of anæmia comes and goes easily, being often present about the feet in the evenings, but disappearing with a night's rest; the eyelids, however, are often puffy in the morning.

3. *The effect of pressure* is said to distinguish between cardiac and renal dropsy, but this is very unreliable. The latter is stated to pit much less, and not to retain the impression long, elasticity not being quite lost.

4. The *appearance* of a dropsical part may indicate its cause. Thus in some cases of renal disease there is a very peculiar dull-white, pasty look about it. In cardiac dropsy signs of venous congestion are often present, with a shining tense aspect of the skin.

5. *Characters of the Fluid.*—That of renal dropsy is of a very low specific gravity, containing only a small quantity of albumen, and urea can often be detected in it.

6. *The Effects of Treatment.*—The dropsy of anæmia is easily got rid off; the renal form is also frequently removed for a time by appropriate treatment. It is difficult to produce absorption of cardiac dropsy, if it is at all great, and it is liable to return speedily, as its cause is permanent.

Treatment.—The objects to be kept in view in the treatment of dropsy are: 1st. Its removal. 2d. The prevention of its recurrence. 3d. If it cannot be removed, to obviate its ill effects. These are carried out by attention to the following principles: 1st. Remove any obvious cause, if possible. 2d. Pay strict attention to rest, position, and regulated pressure. 3d. Aid absorption of the fluid by causing free secretion, by the skin, kidneys or intestines, and thus removing the watery portion of the blood. 4th. If absorption is not practicable, the fluid must be taken away by certain operations. 5th. Improve the condition of the system generally, but especially that of the blood, if it is at fault. 6th. If any organ is diseased, endeavor to restore it to its normal state, or at all events to render it capable of performing its functions so far as is possible. 7th. Attend to cleanliness, and prevent all irritation of dropsical parts.

The particulars of treatment will necessarily differ, according to the cause of the dropsy and the organ affected, and these will be fully considered in their appropriate places. At present only an outline will be given of the manner in which the above principles are to be generally carried out.

1. As illustrations of the removal of the cause may be mentioned the taking away of any pressure or constriction affecting a vein, such as that of a tumor. Also in many cases of cardiac disease, the dropsy is often materially augmented by an attack of acute bronchitis, and by using measures to cure this, a considerable effect may be produced on the effusion.

2. Far too little heed is given to the question of *rest* and *position* in the treatment of dropsy. The part affected should, if necessary, be maintained for a long time, and not merely now and then, in a posture most opposed to the influence of gravitation. For example the legs, if anasarcous, should be kept on a level higher than the body; the scrotum should be raised by means of a pillow of cotton-wool underneath. In many cases, dropsical fluid will quickly disappear by attending to this matter; at the same time its recurrence being prevented by treatment directed to its cause, such as anæmia. *Pressure* is also very valuable if carefully and properly applied.

3. In order to carry out the next indication, viz., the promotion

of absorption, diaphoretics, saline and watery purgatives or diuretics must be used according to circumstances.

The only *diaphoretic* that is of any practical value, is some form of bath that will promote perspiration, such as the warm, vapor, hot air or Turkish bath. These must be used as frequently as required, provided the patient can bear them; or local baths may be employed with much advantage, if the patient cannot sustain general baths. It is in renal dropsy that these are most valuable, and especially in acute cases. They may also be used as preventives of this form of dropsy. Other diaphoretics are recommended, such as ipecacuanha, antimony, spirits of nitre, liquor ammoniæ acetatis, or citrate of potash, but they are not of much service.

Watery purgatives are frequently most useful, but care must of course be exercised in their administration, as they tend to weaken the patient. The most important are elaterium, gamboge, veratrum, calomel, podophyllin, jalap, scammony, and cream of tartar. A combination of jalap and cream of tartar is often very effective, and so is extract of elaterium, beginning with $\frac{1}{8}$th of a grain for a dose, and gradually increasing it to $\frac{1}{2}$ grain or more, combined with extract of hyoscyamus. These may be given two or three times a week or oftener, according as circumstances indicate. Some recommend croton oil. There can be no doubt that the effect of pills, made use of by some quacks, which is sometimes really marvellous, is due to powerful drastic purgatives which they contain.

Diuretics are not nearly so efficacious, Those usually given are nitrate, acetate, or other salts of potash, in large doses freely diluted; cream of tartar in small doses; spirits of nitre; digitalis, either as infusion, tincture, or pill with other ingredients; squill in tincture, or pills; spirits, or infusion of juniper; infusion of fresh broom tops; or oil of turpentine. The following pill will be found in some cases to have a good effect, given every other night:

℞. Ext. elaterii, gr. $\frac{1}{6}$ to gr. $\frac{1}{2}$.
Pulv. scillæ, gr. $\frac{1}{2}$ to gr. i.
Pulv. digitalis, gr. $\frac{1}{2}$ to gr. i.
Ext. hyoscyami, gr. $1\frac{1}{2}$. M. fiat pil.

Digitalis is sometimes used externally, either as a poultice of the leaves, or the powder is rubbed in, or fomentation with its infusion employed; this is said to promote the urinary secretions. Gin or whisky freely diluted is of undoubted service in some cases.

Bloodletting is recommended in some cases, with the view of unloading the vessels, and assisting the action of other remedies, but great care is necessary in its employment.

4. It is frequently necessary to have recourse to certain operations, and I believe they are often delayed to too late a period, and ought in appropriate cases to be employed, not as last resources, but as means of cure, being repeated if required. These operations are—1. Removal of the fluid from serous cavities, by tapping, or paracentesis, especially to be adopted in certain cases of ascites. 2. Puncturing the skin in cases of anasarca, or making incisions of different lengths. It is generally quite sufficient to employ punctures, making several in dependent parts, repeating them as often as required, and taking care that they are not irritated by urine, or other sources of irritation, which may give rise to erysipelas. These will be considered more particularly hereafter.

5. Treatment directed to the system generally, but especially to the improvement of the state of the blood, is always of essential service, and may be the chief thing called for. It is important to look after the state of the digestive and nutritive functions in the first place, and to attend to the diet. Tonics must be given if needed, and, above all, some form of iron, especially the tincture of the perchloride, which has a marked effect on the composition of the blood. In short everything must be done that can improve the condition of the system and the blood. This aids materially in the treatment of cardiac and renal dropsy, and if this symptom is due to anæmia alone, of course it will disappear altogether as the state of the blood improves.

The treatment of special diseases of organs, which produce dropsy, cannot at present be considered.

It is important to keep all external dropsical parts clean, and to prevent them from being in a moist condition, or being unduly pressed upon.

CHAPTER III.

HEMORRHAGE.

HEMORRHAGE signifies an escape of blood in its entirety out of the current of the circulation. It may be due to rupture of the heart itself, or the blood may come from either set of vessels, arteries, capillaries, or veins. Capillary hemorrhages are most frequent in medical practice. As a rule the vessels are ruptured, but it is supposed that bleeding may occur, without actual destruction of the walls, as often no lesion can be detected on the most careful examination, and it is known that the corpuscles, both red and white, can make their way through the coats of the vessels.

The blood may be poured out on a free surface, such as that of the skin, or a mucous or serous membrane; or into the interstices of tissues, into the substance of organs, or into morbid growths. A collection of blood in a solid organ is named an "extravasation," "apoplexy," or, under certain circumstances, a "hemorrhagic infarct."

Special names are used to indicate whence the blood comes, of which the chief are *epistaxis*, or bleeding from the nose; *hæmoptysis*, from the air-passages or lungs; *hæmatemesis*, from the stomach; *melæna*, from the bowels; *hæmaturia*, from the urinary organs; *menorrhagia*, from the female genital organs.

Certain general terms are often applied to hemorrhages, with a view to classifying them, but they are not of much importance. Thus they are said to be *traumatic* or *spontaneous; idiopathic* or *symptomatic; active* or *passive; arterial, venous,* or *capillary; vicarious, critical,* or *periodical.* These terms sufficiently indicate what is meant by them.

Pathological Conditions giving rise to Hemorrhage and their Causes.—1. A vessel may be quite healthy, but be wounded by some direct injury, as from a cut, or the irritation of a foreign body, such as a calculus in the bladder, or a rough foreign material, or dry, hard fæces in the alimentary canal. The opening of a vessel in consequence of ulceration, gangrene, or cancer, frequently comes under this class of causes. Hemorrhage produced in this way is named *traumatic.* 2. Extreme distension of the vessels may end in hemorrhage in the various forms of congestion, even though they are not at all diseased, especially if the force of the circulation is at the same time much increased, as happens when the heart is hypertrophied or is acting excitedly. All causes, therefore, which can induce great congestion, may bring on hemorrhage, which is then usually of the capillary variety. A good illustration of hemorrhage from congestion is that which occurs in the stomach in connection with cirrhosis of the liver. Critical hemorrhages and those vicarious of menstruation, are also due to congestion, as well as those produced by overstraining and local irritation. An important variety of hemorrhage, resulting from congestion, is that associated with the lodgment of an "*embolus*" in a vessel, which produces intense hyperæmia around it, with consequent extravasation, which is then named a "hemorrhagic infarct." 3. A morbid condition of the coats of the vessels is most favorable to hemorrhage, especially arterial. If the arteries are atheromatous, or calcified, a very little increase of pressure upon them may lead to their rupture, especially if they are not well supported, as in the brain. Hence cerebral apoplexy is generally associated with diseased vessels. The rupture of aneurisms also comes under this head. Mere functional debility of the minute vessels and of the tissues around predisposes, and may give rise to hemorrhage, which is then of the passive kind, associated with passive congestion. The weak new vessels in recent inflammatory exudations, and those in certain vascular cysts or villous processes, are very prone to rupture. Varicose veins not unfrequently give way, and severe hemorrhage occurs as the consequence. 4. An abnormal state of the blood is very liable to induce hemorrhage, especially as it is often combined with weakness of the tissues and vessels. Hence it is apt to occur if anæmia is present from any cause, especially if previous hemorrhages have altered the composition of the blood; also in scurvy, purpura, low fevers, especially typhus and smallpox, after bad diet and other lowering conditions, and after chronic diseases of the chief organs. The most important change, however, is that which is met with in the "hemorrhagic diathesis" or "hæmophilia," as it is termed, where excessive bleeding occurs spontaneously, or from very slight causes; in this affection there is a marked deficiency of fibrin with an excess of red corpuscles. On the other hand, a plethoric state of the vascular system is favorable to hemorrhage, and hence it is predisposed to by overfeeding and sedentary habits.

Hemorrhage may occur at any time of life, but it is especially common about the period when growth and development are proceeding rapidly, and in advanced life, when the tissues have become degenerated. It is also prone to affect different parts at different ages; thus in the young epistaxis is frequent; in young adults hæmoptysis; later on, hæmatemesis, hæmaturia, &c., and in old age cerebral apoplexy. Some individuals are much more liable to bleeding than others.

Post-mortem Appearances—When hemorrhage has taken place from a mucous surface, it is often impossible to detect the vessel from which it has occurred, even on the most careful examination, if it is of the capillary kind. Some believe that under these circumstances no actual rupture has happened. Generally the origin of the bleeding may be discovered. Remains of the blood may or may not be met with. Apoplectic extravasations may be very minute points or large clots, either distinct and well-defined or mixed up with the tissues of the organ involved, and there may be one or more; they generally coagulate more or less firmly, and have a dark color at first. Irritation of the surrounding tissues may be evident in the existence of redness, inflammatory exudation, softening, or even an abscess. If the extravasation does not prove fatal soon, the following changes take place in it: 1. The color gradually becomes paler, changing to brown or yellow, and may ultimately become almost white; at the same time a granular pigment often forms and crystals of hæmatoidin. 2. The clot contracts in size, becoming more dense, and being surrounded by a firm capsule of fibrous tissue; it also itself undergoes organization and vascularization in many cases, and may remain permanently in this condition. 3. In some cases it is absorbed, leaving a cystic cavity containing fluid, which may ultimately be taken up also, the walls of the cyst coming together, and a hard cicatrix forming, which is sometimes colored by the pigment remaining unabsorbed. Occasionally nothing is left but pigment, yellow or black, especially on membranes, or there may be no trace of the bleeding except a puckering and contraction. In some cases a clot softens, and comes to resemble pus in appearance.

Symptoms and Effects.—Premonitory symptoms are often present, indicating that hemorrhage is going to take place, but only when it is of the active kind. There may be general excitement of the circulation, with a quick, sharp, and full pulse, or local sensations of weight or fulness and heat are present, with increased pulsation, the extremities being at the same time cold. In special organs, special symptoms often indicate the approach of bleeding.

The actual symptoms depend on the direct effects of the loss of blood upon the system generally, and upon the local effects of that which is poured out.

General.—If the quantity of blood is great, death may ensue almost immediately, by shock; if less, *syncope* or mere faintness may occur; or if the bleeding takes place slowly, only an anæmic condition is produced, without any immediate results.

Local.—These vary with the seat of the hemorrhage, whether it is on a free surface or into the substance of an organ, and with the amount of blood thrown out. Instant death may occur from the mere local results.

They may be summed up as: *a.* Immediate mechanical results of the blood effused, which interferes with the functions of an organ without injuring its textures, such as are observed when the blood escapes into the pericardium, and prevents the heart from acting, or when a large quantity accumulates in the bronchial tubes. *b.* Destructive effects upon the tissues of organs, which are broken up and lacerated. This generally happens when apoplectic extravasations take place into the substance of organs, the functions of which are thus materially interfered with. *c.* Irritating effects of the blood, after it has coagulated, when it may give rise to more or less acute inflammation, with its accompanying symptoms. *d.* If the blood escapes on the free surface of a mucous membrane, it usually excites certain actions, by which it is discharged. Thus vomiting takes place when blood is poured out into the stomach, or coughing when into the air-passages. The amount and characters of the blood which is rejected vary considerably, and by the latter we are often able to give an opinion as to whence it comes. For example, in epistaxis it looks like arterial or venous blood; in hæmoptysis it is generally bright-red, and more or less frothy; in hæmatemesis it is dark, and presents an appearance like coffee-grounds, being altered by the gastric juice, at the same time its reaction being acid; blood coming from the bowels has a tarry aspect when discharged. The blood is often mixed with secretions and other substances to a greater or less degree.

The presence of blood is often indicated by "physical signs," as, for instance, in the bronchial tubes or pleural cavity.

Diagnosis.—The main point in diagnosis is to make out the source of a hemorrhage, should the blood be discharged. This will be fully discussed when the individual hemorrhages are considered, and cannot be entered upon at present. With regard to extravasations, it is often important to know their amount and extent, and the part of the organ in which they exist.

Prognosis.—This will chiefly depend upon—*a.* The quantity of blood lost. *b.* The seat of the hemorrhage. *c.* The state of the patient, and the immediate obvious effects of the bleeding. *d.* Whether it is possible to put a stop to the bleeding, or if this is liable to be repeated.

Treatment.—The indications are—1. To stop the bleeding, if desirable, should it be continuing, and to prevent its recurrence. 2. To obviate its ill effects generally, and restore the patient to a healthy condition. 3. To look to the local effects of the blood.

1. It may be a question in some cases whether it is desirable to stop hemorrhage, if it is not serious, as this may be warding off some worse evil, *e. g.*, in the case of bleeding from piles, or epistaxis. Supposing it to be advisable to check the bleeding, as it usually is, the following are the means to be employed under different circumstances:

i. There should be absolute rest of the body in the horizontal posture, and, so far as is practicable, of the part affected. Hence every disturbing action should be avoided, such as cough in hæmoptysis, or vomiting in hæmatemesis. At the same time the circulation must be calmed, and everything that can excite the heart be guarded against. Venesection has been often performed, with a view of lowering the heart's action, but this measure is very rarely indicated.

ii. Attention to *position* is sometimes most serviceable; thus in bleeding from varicose veins of the leg all that is needful is to raise the leg above the level of the body. Everything that can interfere with the return of blood by the veins must be avoided.

iii. The internal administration of astringents in full doses is often called for; acetate of lead, gallic and tannic acids, sulphuric acid, alum, oil of turpentine, ergot of rye, matico, and tincture of steel, constitute the most important. Some of these may be appropriately combined, and tincture of *opium* or *digitalis* forms a most useful addition. Recently a subcutaneous injection of ergotin has been employed. Everything in the shape of food or drink should be taken cold, stimulants being avoided, unless absolutely required. In some hemorrhages the constant sucking of ice is most valuable.

iv. Local remedies may be indicated, such as pressure, astringents, cold, in the form of ice, &c., or even more powerful applications, as the actual cautery; it may be necessary to employ torsion or ligature, as described in surgical works. Applying cold to *neighboring* parts is often very useful, *e. g.*, to the chest or epigastrium, in hæmoptysis and hæmatemesis, or even to distant parts, as in the case of epistaxis.

v. It may be necessary to improve the condition of the patient by the exhibition of good diet, tonics, and special medicines, at the same time that astringents are used; thus the constitution of the blood and state of the tissues are improved should these be at fault, and give rise to a tendency to bleeding.

vi. Sometimes it is advisable to draw off blood to other parts by means of heat or sinapisms to the extremities, or by the use of Junod's boot, or to prevent it from entering a part by means of pressure on the arteries.

2. If *syncope* occurs, this must be treated by position and appropriate remedies, as will be hereafter explained. Any anæmia

must be removed by the administration of some form of iron, with proper dietetic and hygienic treatment.

3. The third indication is best carried out by keeping the part entirely at rest, and by employing measures which promote the absorption or removal of the effused blood, these varying according to circumstances. Iodide of potassium is often very useful in aiding absorption, and so is blistering. If inflammation is set up this must be treated by appropriate remedies.

CHAPTER IV.

INFLAMMATION.

WITHOUT attempting any comprehensive definition of this most important pathological change, I propose briefly to consider the principal points in connection with it in succession, and thus endeavor to give some concise information as to the present state of knowledge on the subject, though there are questions connected with inflammation, the full treatment of which does not come within the province of this work.

I. CHANGES AS SEEN BY THE MICROSCOPE IN INFLAMED TISSUES.

These may be studied by irritating the transparent vascular tissues of animals, and watching the effects. The web of the frog's foot, its mesentery or tongue, and the bat's wing, are most commonly employed for this purpose, and the following phenomena are observed:

A. *Changes in the Bloodvessels and Circulation.*

1. *The Bloodvessels become Altered.*—In almost all cases there is an immediate dilatation of the small arteries, with elongation and tortuosity, which increases for some 10 or 12 hours, and then remains stationary. Rarely a primary contraction occurs, of

short duration. The veins enlarge after a time. Their shape also becomes altered, little irregular bulgings and contractions being evident, giving rise to a varicose or aneurismal appearance. The capillary walls undergo structural changes in course of time, becoming the seat of fat-granules, especially around the nuclei, and they send out processes by budding, which finally join together.

2. *The Circulation is Disturbed.*—There is at first an *increased rapidity* in the flow of blood, except when contraction occurs. This is soon followed, however, by a rather sudden return to the normal rate of movement, and then the circulation becomes slower, this beginning in the veins. A to-and-fro oscillation is then often seen, and finally complete *stasis* or stagnation occurs, the vessels appearing crowded with red corpuscles. Neighboring vessels often present all these different conditions with regard to movements, and around the centre of stasis, the vessels are usually overloaded, the circulation being slow; while beyond this still, the flow is increased in rapidity.

3. *Important Phenomena occur in Connection with the Blood Corpuscles.*—The *white corpuscles* accumulate in the vessels, especially in the veins, and they adhere to the walls, forming a continuous layer, which is motionless, the central current still continuing, until stasis occurs. Some believe that there is an actual production of these in the part, and that thus their number is increased; after a time they penetrate the walls of the capillaries, and may be observed in various stages of their transit, forming button-shaped elevations, then hemispherical prominences, then pear-shaped bodies, and finally separating altogether. This process is due to the power which these corpuscles possess of spontaneous movement, of altering in shape, and digesting the protoplasm of the vascular walls, by virtue of their amœboid nature, so that no actual opening is left, showing where they have escaped. To these liberated white corpuscles the name "leucocytes" is now given, and after they leave the vessels, they send out processes, assume peculiar shapes, and "migrate" far and wide into the surrounding tissues; at the same time, often undergoing a process of division, and thus becoming increased in number. How they are supposed to contribute to the formation of

the various materials met with in inflamed textures, will be hereafter considered. The *red corpuscles* exhibit the same tendency to aggregation and stasis, and they may so adhere that their outlines are quite obscured. In many cases they also "migrate" through the walls of the vessels, but not nearly to the same extent as the white blood-cells. Dr. Lionel Beale states that in inflammation little particles of *bioplasm*, or germinal matter, of the blood, pass through small rents or fissures in the capillary walls, and afterwards grow and multiply by division. Some of these are detached from white corpuscles. He considers that most of the particles seen outside the vessels, originate in this way, and not from the direct transit of white corpuscles.

4. *An exudation of liquid more or less approaching to "liquor sanguinis," generally takes place, but not invariably.* There is always a tendency to the escape of fluid from the vessels of inflamed tissues, which, though usually called "liquor sanguinis," is rarely identical with this in composition. It may be mere serum, but as a rule contains fibrin, as well as albumen, and also a considerable proportion of phosphates, chlorides, and carbonates. Its nature and quantity will vary much, according to the seat and intensity of the inflammation, as will be more fully alluded to further on.

The alterations thus far described in connection with vascular tissues, of course cannot be observed in those which have no vessels; but they may then be noticed in the vessels of neighboring tissues, from which the nutriment for the non-vascular structures is derived.

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B. *Changes in the Affected Tissue.*

The nutrive process in the tissues themselves becomes rapidly disturbed when inflammation sets in, and in some structures this is the only perceptible deviation from health, there being no appreciable amount of exudation. Such inflammations are named "parenchymatous," and are observed in connection with cartilages, and certain organs, such as the kidneys. The first tendency is to the active formation of cells, or *cell-proliferation* or *germination*, as it is termed, which results from the increase in size of those already existing, and of their nuclei, and the division of the latter, along with the protoplasm of the cell contents, so as to form new cells (endogenous formation). They also undergo many changes in form, and exhibit amœboid movements. This cell-proliferation is in proportion to the intensity of the inflammation, but varies greatly in different tissues. In epithelial structures it is very rapid; less so in connective tissue, cartilage, bone, and the cells of organs, and does not occur at all in the higher tissues, such as nerve. These new cells are prone to decay, especially if they are very quickly produced, and the inflammation has been severe; but they may develop into a permanent tissue, which tends to be of lower organization than the original. Where intercellular substance exists, it often softens and breaks down and the entire structure may become at last completely destroyed, the histological elements being involved in the degeneration. Dr. Beale describes the "bioplasm" of inflamed tissues, as increasing greatly in amount.

II. Nature and Origin of Inflammation, with the Explanation of the Phenomena observed.

Formerly it was believed that the various changes observed in inflammation could be explained on physical principles; thus the changes in the circulation and ultimate stasis were attributed to dilatation of the vessels; to blocking up of the capillaries by the successive formation of white corpuscles, and the adhesion of these, as well as of the red globules, to the walls of the vessels, and to each other; to the development of minute coagula; and to inspissation of the liquor sanguinis. Exudation was believed to be the necessary result of this stasis, and of the dilatation of the vessels. Of late years, however, there has been a growing conviction that the phenomena of inflammation are due to some disturbance in the mutual vital relations of the tissues, bloodvessels, and blood. This pathological process, affecting the nutritive conditions, results from some injury to or irritation of a tissue, direct or indirect. An impression is thus produced on the centripetal or sensory nerves, which is communicated to the vaso-motor centre, there reflected to the centrifugal or vaso-motor nerves, and conveyed by them to the vessels, which consequently dilate, probably owing to a paralysis of their muscular coat. The primary acceleration of the flow of blood may be due to this dilatation, but the subsequent phenomena are probably the result of some alteration in the vital properties of the living tissues, including the coats of the vessels and the surrounding structural elements. The former are so deranged as to lead to stasis, and to allow of the free passage of liquid and leucocytes, having lost their resisting power. With regard to the cell-proliferation and increase of bioplasm, this is supposed to be due to the direct influence of the abundant supply and frequent change of the nutritive fluid, viz., the "liquor sanguinis," in stimulating growth and development. It is not unreasonable to suppose, however, that the primary irritation may immediately set up this overgrowth, or that it may be originated through the nerves directly, while it may possibly itself tend to promote a free escape of fluid from the vessels, because it causes a greater demand for nutriment. Some pathologists believe that the whole process of inflammation is due to a direct change in the vessels or blood, set up by the molecular tissues of the part affected, and that it is not produced through the nerves.

III. Results and Products.

1. The changes already described having taken place, to a greater or less extent, what is termed *resolution* may occur, which means a subsidence of the vascular disturbances, and the absorption of any exudation, leaving the tissue unaffected. Any leucocytes which are present either undergo fatty degeneration before absorption, or possibly may enter the bloodvessels or lymphatics again. Resolution may take place very quickly, then named *delitescence;* or *metastasis* may happen, *i. e.*, the disappearance of inflammation from one part, with its simultaneous appearance in another.

2. *Exudation and Effusion.*—As has been already stated, there is an escape of fluid from the vessels in inflammation, varying much in quantity and composition. These effusions include *serum, fibrinous exudation* or *lymph, blood,* and *mucin.*

a. *Serum.*—Instances of this effusion are well seen in connection with inflammation of serous membranes, or in the submucous tissue in certain parts. It is not uniform in its composition and characters, but contains a variable amount of albumen, and generally also fibrin, with a considerable quantity of phosphates and chlorides. It may continue for a long time unaltered, or is absorbed if the inflammation subsides, or may become changed into pus.

b. *Fibrinous Exudation, Lymph, Coagulable Lymph, Inflammatory Exudation.*—An exudation escapes from the vessels in some forms of inflammation, which is coagulable, containing much fibrin, and to this the above names have been applied. There is really, however, no distinct line of demarcation between this exudation and the serous effusion resulting from inflammation. It has a number of leucocytes in it, as wells as cells, resulting from proliferation, and Dr. Beale describes it as containing more or less of the particles of "bioplasm." In many cases organization tends to take place in it, but some are of opinion that only the cells and bioplasm become developed, the lymph merely nourishing these; others think that the fibrin coagulates and fibrillates, and itself contributes to the formation of new tissues.

Two kinds of lymph are recognized, viz., the *plastic* or *fibrinous*, which contains abundant fibrin-forming ingredients, tends to coagulate, and promotes development of tissues; and the *aplastic, corpuscular*, or *croupous*, in which there are a large number of cells, with little tendency to organization, but rather a proneness to degeneration and to the formation of pus or other low products. The condition of the patient, the seat and intensity of the inflammation, and other causes, influence materially the nature of the exudation.

After inflammation has subsided, the cells, which are derived from leucocytes, or from proliferation in the affected tissue, as well as the masses of germinal matter, may become developed and organized. Some form of connective or fibrous tissue is that generally produced, but bone, elastic tissue, epithelium, or fat, may be ultimately formed. Certain of the higher tissues are never developed under these circumstances. This organization into new tissue is well seen in the changes which occur in the granulation-tissue by which wounds cicatrize, and in the adhesions and thickenings formed in connection with inflamed serous membranes. The consequences of these changes are often very serious, structures becoming thickened, hardened, contracted, or bound together, and transparent tissues being rendered opaque.

After organization, a process of degeneration may set in, as shown by wasting or withering, the substance becoming dry, yellow, horny, and stiff; by fatty or liquefactive change, which may lead to its absorption; or by the formation of black pigment. Similar changes may occur in the products of corpuscular lymph.

In the majority of tissues the cells which undergo development are at first derived from leucocytes, afterwards others are formed by cell-proliferation.

c. *Blood* is sometimes present in inflammatory exudations. It is partly the result of migration of the red corpuscles, but may be due to the actual rupture of vessels, especially of those recently formed.

d. *Mucin.*—In some inflammations of mucous membranes this substance is met with, and gives a tenacious, stringy character to the fluid discharged from the surface.

3. *Suppuration or Formation of Pus.*—The tendency to the occurrence of this process varies according to the tissue affected, and to the constitutional condition, and it generally is more liable to take place if the inflammation is very severe and concentrated. Pus may form on a free surface, and be discharged, being often mixed more or less with other materials; it may accumulate in cavities, such as those of serous membranes; or it may involve the substance of tissues and organs, as a circumscribed abscess, or as diffuse purulent infiltration. In its physical characters it is a thick, viscid, pale-yellow liquid, odorless, alkaline in reaction, with a specific gravity of about 1030. It consists of a fluid, "liquor puris," in which float pus-corpuscles and other microscopic particles. Liquor puris is an albuminous fluid, but also contains salts, pyin, chondrin, and fat. The corpuscles closely resemble pale blood-corpuscles in size and appearance, being more or less round, or sometimes irregular, granular, and having one or more nuclei, which are rendered more evident by acetic acid, and often break up when acted upon by this reagent. They have the power of spontaneous movement and migration, and they can

alter in form, as well as increase in number, by fission. Dr. Beale describes pus-corpuscles in the *living* state, as being masses of bioplasm, without any cell-wall, which assume a variety of forms but are never spherical, send out protrusions in all directions, these becoming detached and forming new corpuscles, and which are capable of spontaneous movement. When *dead*, they assume the spherical form, their movements cease, a sort of cell-wall forms, they become more granular, and bacteria are developed in them. It is in this condition they are usually seen under the microscope. It is now generally considered that the great majority of these cells, especially in the earlier stages of inflammation, are merely white blood-corpuscles which have migrated, *i. e.*, leucocytes. Beale believes they are derived from the particles of bioplasm which escape. Afterwards others are formed by the proliferation of the cells and germinal matter of the tissue affected, and they increase in number by cleavage and endogenous formation. These "leucocytes" possess the power of destroying the tissues with which they come into contact, and it is partly in this manner that an abscess makes its way to the surface.

Various kinds of pus are described, such as "healthy or laudable," "ichorous or watery," "serous," "sanious," &c., but for further information with regard to these, reference must be made to surgical works. It may decompose and form very noxious gases, and it sometimes undergoes physical and vital changes, if not discharged, its fluid portion being absorbed, its cells becoming withered, and undergoing fatty degeneration, so that it is converted into a cheesy mass, containing fat-granules, shrivelled cells, and nuclei. Ultimately it may calcify.

4. *Softening* of tissues is not an uncommon result of inflammation, and it may proceed to such a degree as to cause the complete breaking up of the structures affected. This may be illustrated by the softening which takes place in inflammation of the brain.

5. *Induration* is another consequence of inflammation, especially when chronic, being due to the substitution of an imperfect fibrous tissue for the normal structures.

6. *Interstitial absorption* is sometimes observed, as in the case of inflammation of bone.

7. *Ulceration.*—When inflammation destroys the tissues on a surface, an *ulcer* is produced. If this is quite superficial, only epithelium being removed, it is termed an "excoriation" or "abrasion." Ulcers frequently come under the notice of the physician, in connsction with mucous surfaces, and they present many differences as to form, size, and appearance. Usually a discharge of pus takes place from the surface after the inflammatory process subsides. An ulcer tends to cicatrize, by the development of granulation-tissue into fibrous tissue, which afterwards is liable to contract, leading to serious consequences. Ultimately the original structures may be developed anew, but this does not occur for a long time, and some tissues are never reproduced.

8. *Gangrene or Mortification.*—If the inflammation is very severe, rapid death of the involved tissue in mass may occur, under certain circumstances, and a slough is formed which becomes isolated from the living textures, and undergoes a process of separation, leaving an ulcerated surface. It is the result of direct injury to the vitality of the structure, of the stagnation of blood, and of the injurious effects produced by the exudations. Almost any tissue may mortify from this cause, but it is particularly observed in the subcutaneous areolar tissue, and in the mucous membrane of the alimentary canal. Gangrene is rarely seen in organs.

The gangrene is of the "moist" kind, and therefore the slough is prone to decomposition.

Different tissues are liable to different kinds of inflammation as regards its products and terminations. This is well illustrated by a comparison between the results of inflammation, affecting serous and mucous membranes respectively, which it is advisable briefly to consider.

In *serous inflammations* there is at first marked redness, with loss of polish, more or less opacity, and thickening of the membrane. Then a fibrinous exudation is deposited on the surface, varying much in its amount, characters, and arrangement, which contains abundant cells, chiefly leucocytes, but partly derived from cell-proliferation in connection with the epithelium-particles. At the same time an effusion of fluid takes place into the serous cavity, more or less turbid, and containing coagula, as well as abundant cells, similar to those in the fibrinous layer. The further tendency is usually to the absorption of this fluid and to the formation of thickenings, adhesions, or agglutinations in connection with the serous membrane. These are generally supposed to result from the organization of the layer of lymph, with its inclosed cells, as the result of which fibrous tissue is produced. It has been stated, however, by some pathologists that, at least in many cases, this fibrinous layer is not organized, but undergoes fatty degeneration and becomes absorbed, and that the adhesions are produced by the development of small vascular papillæ, or granulations, which form on the surface of the membrane under the epithelium. If the inflammation is very intense or long-continued the fluid may become purulent, and this is also apt to occur in certain constitutional conditions.

Though serous inflammations vary much in their extent and products, according to circumstances, it may be stated that their general tendency is to produce materials which are capable of organization.

In connection with *mucous membranes* three varieties of inflammation are met with, viz., *catarrhal; croupous, membranous, plastic,* or *fibrinous;* and *diphtheritic.*

Catarrhal.—This is the ordinary form. It commences with hyperæmia and swelling of the membrane, which is at first abnormally dry. Soon, however, there is an increased secretion of viscid mucus, containing abundant cells, derived from the proliferation of the epithelium and from leucocytes, and if the inflammation continues the discharge assumes a more or less purulent appearance, owing to the large number of cells mixed with it, many of which have the precise characters of pus-cells. The glands and follicles enlarge, and become also filled with cells. In some cases the submucous tissue becomes infiltrated, and if it is loose, a considerable amount of serum may collect in it. Abrasions or ulcers are not unfrequently produced. If the inflammation becomes chronic, considerable changes take place in the structure of the membrane and its glands.

Croupous.—This variety differs from the former, in that a layer of "false membrane" is deposited on the surface, varying in thickness and consistence. This consists of coagulated fibrin, either amorphous or fibrillated, inclosing epithelium and pus-cells. Recently it has been described as being entirely made up of altered epithelium cells without any fibrin. In some cases, however, it is distinctly fibrillated, but it shows no tendency to become permanently organized.

Diphtheritic.—Here there is fibrinous exudation not only upon, but into and beneath the mucous membrane, which, as a result, is destroyed and converted into a slough, and an ulcerated surface is left on its separation.

It will thus be seen that inflammation of mucous membranes differs from that of serous membranes, in the products having no tendency to be organized, owing to the abundance of cellular elements which are discharged in the secretions.

IV. SYMPTOMS AND SIGNS.

1. *Local;* a. *Objective.*—If an inflamed part is visible, it generally presents three well-known objective signs of the change, viz., *redness*, *swelling*, and *heat.*

The *redness* varies in degree and hue, the latter tending generally to be bright. It is more marked towards the centre of the inflammation and fades off at the circumference, disappearing more or less under pressure. It is due chiefly to the overloading of the vessels and blood stasis, but may be partly the result of migration of red corpuscles or rupture of vessels, and consequent extravasation. No redness can exist in a tissue which is non-vascular, but then the neighboring structures from which this receives its nutriment exhibits this character. As already stated, redness may disappear after death, owing to contraction of the arteries.

The amount of *swelling* varies greatly, and it may be accompanied with a hard or soft feeling, according to circumstances. The increased quantity of blood in a part, and the different exudations and effusions poured out, as well as the proliferation of tissue, will explain the occurrence of enlargement, which may be a source of much trouble.

Increased local heat is often quite evident to the touch, or it may only be detected by the thermometer. It is chiefly due to the great activity of chemical and nutritive changes in the part, and, to some extent, to the increased flow of blood through it. Dr. Beale attributes it to the rapid growth of bioplasm.

These objective changes exist also in internal inflammation, but here, of course, they do not come under observation during life; we are often, however, able to determine the physical conditions of organs and tissues, as regards the presence of exudation and effusion, resulting from inflammation, by careful physical examination, as will be explained hereafter.

(b.) *Subjective.—Pain* is very commonly present in inflammation. It varies greatly in its intensity and characters, according to the tissue affected; and it must be remembered that it is by no means unfrequently absent when tissues are inflamed, which as a rule, give rise to much pain. Anything that disturbs the rest of an affected structure, or irritates it, will generally increase the pain, and there is almost always *tenderness*, which may exist alone. Pain is necessarily due to the nerves being affected in some way, either being involved in the inflammatory process, or being pressed upon by exudations. In some instances sympathetic pains are complained of in parts distant from the seat of inflammation; and occasionally pain may only exist in some other part, which is supplied by the same nerve as that which is affected.

The *functions* of organs and structures which are inflamed are always disturbed, and often those of adjoining parts are implicated. This disturbance is produced by direct changes in the tissues; by the mechanical effects of the various materials which accumulate, as is well observed in serous inflammations; and by the acts which they often excite with a view to their removal, such as cough in bronchitis. By observing therefore to what organs any symptoms present are referable, we are generally able to fix upon the site of an inflammation. Secretions are always modified as to quantity and composition when the organs producing them are inflamed.

2. *General or Constitutional.*—At present it must suffice to state, that the symptoms comprised under the term "fever" are those met with in inflammation, if this is of an acute nature. What these symptoms are will be again considered. The fever is usually

of the inflammatory type at the outset, but varies greatly in its degree, especially according to the tissue affected. It may be considered "symptomatic" or "sympathetic." Should suppuration set in, a severe fit of shivering commonly occurs, and the fever is apt to become *adynamic* or *hectic*. The typhoid or "adynamic" type of fever is also present if gangrene occurs, as well as under other circumstances.

As a rule the *blood* is hyperinotic, containing excess of fibrin, and coagulating firmly, often presenting the "buffy" coat. Water is in excess, but albumen and salts are deficient. The red corpuscles show a marked tendency to run together, and form "rouleaux" under the microscope.

The origin of the fever is supposed to be either that the vasomotor nerves generally are paralyzed, or that the temperature of the blood as a whole is raised through the local production of increased heat.

V. CAUSES.

A. *Predisposing.*—These influence not only the occurrence of inflammation, but also the part it affects and the variety it assumes.

1. *General.*—The condition of the system as a whole, but especially that of the blood, acts most powerfully in predisposing to inflammation. If a person is weakened, and the blood impoverished, either from deficient nourishment, acute or chronic diseases, vicious habits, bad hygienic conditions, or any other cause, inflammatory affections are very liable to be met with. On the other hand, a very plethoric individual, who overfeeds, indulges in stimulants to excess, and leads a generally luxurious life, is also exceedingly prone to be attacked. The most important general conditions, however, which predispose to inflammation, are those in which there is a *poison* in the blood, either introduced from without, or generated from within, and under these circumstances it is often of a *special kind*, and affects particular tissues. Illustrations of these are afforded by the eruptive fevers, gout and rheumatism, syphilis, diabetes, &c. The overloading of the blood with the materials formed as the result of destruction of tissues also promotes inflammation. This may occur either

from a too rapid disintegration of tissues, as in fevers, or because the excreting organs do not act properly, as in renal disease or extensive cutaneous eruptions. Children and old people are more liable to inflammation on the whole, but not of all structures. Persons of sanguine temperament are said to be more liable to inflammation than others.

2. *Local.*—Among the most important local conditions which predispose to the occurrence of inflammation in a particular part, are mechanical or passive congestion; defective nutrition, leading to a debilitated state of the tissues, in which their power of resistance is impaired, such as exists after a previous attack of inflammation, or when the vessels are in a state of degeneration, as in old age; and impaired innervation. The last cause acts partly by the direct interference with the nutritive process thus produced, and the lowering of vitality, but chiefly by diminishing the power of feeling and motion, so that irritants are allowed to act for a long time without the patient being aware of their presence, who, further, cannot remove them.

B. *Exciting.*—1. *Mechanical injury or irritation* of all kinds is a common cause of inflammation. This may come from without, in the form of wounds or bruises, or be originated within the body, as from calculi, extravasated blood, retained excretions, worms, tumors, gouty concretions, and deposits of various kinds.

2. *Chemical irritants* often produce inflammation, and under this head may be included that resulting from the application of great heat or cold. A specific kind of inflammation may be produced from this cause, as, for example, when croton oil, tartar emetic, or a blister is applied to the surface. The inflammation resulting from the contact of air with certain surfaces, of pus, or gangrenous fluids, may be included in this category, as well as that due to improper food.

3. The direct introduction or contact of certain *specific poisons* leads to inflammation. This is illustrated by small-pox, vaccination, glanders, syphilis, gonorrhœa, &c.

4. The cause of inflammation may exist in the blood itself. A chemical or organic poison may be *introduced from without*, such as arsenic, cantharides, or a contagious poison, and then produce its special effects. For instance, arsenic always inflames

the stomach, and cantharides the kidneys, while the different acute specific fevers are characterized by special inflammatory eruptions, and peculiar affections of structures or organs. Or the irritant may be *generated within the system*, as happens in the case of rheumatism or gout, or where there is successive destruction of tissues, and the materials thus formed may act as exciting, as well as predisposing causes of inflammation, which is then *secondary*.

5. Internal inflammations are often caused by cold and wet acting upon the skin and producing a "chill," especially if the body happen to be in a state of heat and perspiration. These act principally by contracting the small cutaneous vessels, and driving the blood inwardly, but also by interfering with the excretion by the skin, and hence noxious materials accumulate in the blood. Inflammations produced in this way are often called *idiopathic* or *primary*.

VI. Varieties.

Inflammation presents many varieties, to which particular names are applied, and which are founded on different characters. Thus it is said to be—a. *Acute* or *chronic*, according to its intensity and rate of progress. b. *Sthenic* or *asthenic*, according to the general symptoms present. c. *Plastic*, *adhesive*, *suppurative*, *ulcerative*, or *gangrenous*, according to its products and termination. d. *Circumscribed* or *diffuse*. e. *Healthy* or *phlegmonous*, or *unhealthy*. f. *Non-specific*, or *specific*, the latter including rheumatic, gouty, syphilitic, gonorrhœal, strumous, tubercular, and other special forms of inflammation.

VII. Treatment.

It is not easy to give even an outline of the treatment of inflammation in a general way, as it varies so much under different circumstances. At present only the chief principles will be briefly pointed out.

1. It is important to take measures to *prevent* inflammation from occurring, if conditions exist which are likely to give rise to it. For instance, after an injury, the part affected should be

kept at rest, and appropriate remedies applied. In conditions of the blood which tend to cause secondary inflammation, every care should be taken to ward off all influences likely to produce this result. If there is paralysis of a nerve, all sources of irritation must be avoided. Illustrations of this point might be added to any extent.

2. Supposing inflammation to exist, the chief indications we have in treatment are—*a.* To subdue the process as soon as possible, and prevent the different exudations and effusions from accumulating. *b.* Should these have been poured out, we have to endeavor to limit them, and get them absorbed, or removed in some other way as soon as possible, leaving the tissue or organ affected in as normal a condition as can be obtained. *c.* To guard against all untoward terminations, such as suppuration, gangrene, or ulceration, and treat them if they occur. *d.* To treat the general condition of the patient, as regards fever, constitutional disorder, &c., and look to the special character of the inflammation. *e.* It may be requisite to pay attention to local symptoms produced by the inflammation.

In order to carry out the first indication, the primary thing to be attended to, is to *remove the cause* of the inflammation, if this can be done; to keep the part affected in as *complete a condition of rest as possible,* including the cessation of all physiological functions; at the same time avoiding every source of irritation, and paying attention to *position* so as to prevent accumulation of blood. Thus further irritation will be prevented, and the conditions be most favorable for restoration to a normal state. The remedial measures employed, are those usually termed *antiphlogistic,* and they have for their object, the lowering of the increased vascular action in the inflamed tissue, both as regards the quantity of blood present and its rate of movement. The following are the most important: (a.) *Direct removal of blood.* Formerly if any inflammation was supposed to exist, recourse was immediately had to this measure, but at the present day the tendency is to go to the opposite extreme, and give up bloodletting altogether. Blood may either be removed by *venesection,* and thus taken from the general mass, at the same time the heart's action being moderated thereby (general bloodletting), or it may be taken immediately from the vessels in the neighborhood of the affected part, by leeches, cupping, punctures, scarifications, or incisions (local bloodletting). With regard to the former method, without entering into a discussion on the subject, which space will not allow, I venture to express the opinion that it is not often required, and that great care should be exercised in determining that any individual case is adapted for it. This will depend chiefly upon the tissue or organ affected, and the condition of the patient. It will be hereafter pointed out what inflammations may require venesection, but as regards the state of the patient, it should never be practiced if there is debility, or if the inflammation is dependent upon some morbid poison in the blood. If performed at all, it should be had recourse to at an early period, before inflammatory products heve accumulated, and the structures have been consequently deteriorated.

Local bloodletting is often most valuable, and there can be no doubt that we do not make use of it to the extent which it deserves. By means of it, we can often relieve materially the vessels of a part, and thus produce a most beneficial local effect, without influencing much the general bulk of the blood, or depressing the patient to any degree.

b. Some very powerful medicinal agents have of late years been much recommended in various inflammations, which have a direct influence on the heart, diminishing the number of its beats. Of these the most important are *aconite*, *veratrum viride*, and *digitalis*. The first of these is strongly advocated by Dr. Ringer in inflammation, especially if this is not extensive or severe.

Tartar emetic has long occupied a prominent position in the treatment of certain inflammations, and justly so; it exerts a powerful influence over the heart, but acts further, by increasing some of the secretions.

c. A very important class of remedies, which are most valuable in some inflammations, if properly employed, are those which increase the different excretions and thus relieve the bloodvessels, including *purgatives*, *diaphoretics*, and *diuretics*. The first of these must be used cautiously, but it is generally advisable to keep the bowels freely open, and purgatives are particularly useful in many inflammatory affections of the liver, or, when the blood is loaded with the products of decomposed tissues. The best *diaphoretic* is some form of bath, especially the vapor, hot-air, or Turkish bath. Of course they are contraindicated if there is any local inflammation of the bowels, skin, or kidneys.

d. *Local Measures.*—We have some important means of subduing locally the increased vascular action, in addition to bleeding. Among these the most valuable is the *application of cold.* It may be applied in the form of rags dipped in cold water, or evaporating spirit lotions, cold irrigation, ice, or ice and salt in a bag. It is in the early stage that this remedy is so useful, and also when the inflammation is quite superficial, or affects structures near the surface.

Heat and moisture act very beneficially in some cases, in the form of hot-water dressing, poultices, or hot fomentations. In other instances, turpentine fomentations, mustard poultices, or even blisters, are valuable. All these act by determining the blood to the surface. The application of belladonna has been recommended in inflammation of superficial parts.

The second indication will be favored by attention to some of the points already mentioned, such as rest and position.

In order to aid absorption, certain medicinal agents are extensively used. Of these *mercury,* in some form, is very commonly employed. In certain cases this drug acts most effectively, viz., when syphilis exists; but as a rule it ought to be avoided, or at least used with great caution; a great deal of harm has been, and still is done by its indiscriminate use.

Iodine, especially in the form of iodide of potassium, is often of much service. Liquor potassæ is sometimes employed, but its value is not established.

Local measures are attended with excellent results often. The most important include the *various forms of counter-irritation,* such as blisters, painting with a solution of iodine, irritating liniments, issues, setons, or the actual cautery. Friction and *regulated pressure* are, in some cases, most serviceable, and in practicing the former it may be advisable sometimes to use absorbent liniments or ointments. Mercurial ointment is much employed.

Acting freely on the various secreting organs undoubtedly assists absorption in some cases, but especially exciting the skin by means of the various baths. I have found this to aid in no small degree in getting rid of pleuritic effusions. In some cases the products of inflammation cannot be absorbed, and then we may be obliged to have recourse to operations for their removal. In other instances, what we have to do is to encourage certain acts by which these products are discharged, such as coughing in bronchitis.

With regard to the *general treatment.* The various forms of fever met with, must be treated according to the principles which will be laid down when considering this subject.

If any *specific inflammation* exists, due to a *specific constitutional condition*, particular remedies are called for, such as mercury in syphilis, colchicum in gout, or alkalies in rheumatism. In certain forms of inflammation also special medicines have been found useful, such as tincture of iron in erysipelas, chlorate of potash in inflammations about the mouth and throat. Diet must vary according to circumstances, and it is impossible to lay down any rules, so much depending on the part affected, the state of the patient, and other circumstances. If there is any tendency to depression, nourishing diet and stimulants are called for, often in considerable quantity, and this is especially the case if suppuration, ulceration, or gangrene sets in. *Tonics*, such as quinine, bark, mineral acids, steel, as well as cod-liver oil, are then generally required.

Of course it is necessary to pay careful attention to all hygienic conditions.

Should *suppuration*, *ulceration*, or *gangrene* set in, notwithstanding that all care has been exercised to guard against them, they must be treated by appropriate measures. The discharge of pus must be encouraged, ulceration healed, and the separation of dead parts promoted.

The *local symptoms*, depending upon the part affected, often require careful attention. Among these a prominent one is *pain*. For the relief of this, many of the remedies already considered are very valuable, but the most important drug for this purpose is *opium*. It is exceedingly serviceable in many inflammations in various other ways, such as by inducing sleep, stopping the peristaltic action of muscular tissues, allaying irritability, and probably directly influencing the inflammatory process. It must be given with great caution under certain circumstances, viz., if the respiratory organs, kidneys, or brain are involved. *Hydrate of chloral* and other sedatives are also very useful in some cases, for the relief of pain and sleeplessness.

CHAPTER V.

HYPERTROPHY.

THIS terms implies an overgrowth, and ought to be strictly limited in its meaning to the "increase in an organ or structure of its normal tissue elements." In ordinary language, organs are often said to be hypertrophied, when they are enlarged from other causes, but this is not correct. The tissue may be augmented, either from an enlargement of its previously existing constituents, or from the formation of additional ones. The latter mode of overgrowth is now termed "numerical hypertrophy," or "hyperplasia," and is very common in cellular tissue. It must be remembered that an organ is usually made up of several tissues, either of which may be the seat of hypertrophy, and thus its active functions may be improved, or the reverse. For instance, as has been lately pointed out by Dr. Quain, in the heart either the muscular tissue, the fibrous tissue, or the fat may be increased, and each form is a true hypertrophy of a certain kind. In most cases, however, it is the active tissue that is increased, and the functions of an organ are promoted thereby. Muscle is peculiarly prone to hypertrophy.

Effects.—Increase in weight is the only necessary result of hypertrophy. Often there is a change in the size of an organ, and sometimes in the shape, but not always. The walls of hollow organs are generally thickened. The physical conditions of the tissue may be quite natural as regards color, consistence, &c., or they may be, as it were, *too healthy*, or the reverse. An organ is often at first improved by hypertrophy, but afterwards degenerates, as may be seen in the heart. The symptoms, if any, are those indicating increased activity on the part of the organ affected.

Causes.—1. In the great majority of cases hypertrophy is the result *of an organ or part being called upon to do extra work*, and it is truly a conservative lesion, to ward off some evil consequences which might otherwise ensue. Thus, in the case of hollow muscular organs, whenever an obstruction exists at an orifice or elsewhere, interfering with the exit of their contents, the tissues, especially the muscular, almost always hypertrophy, in order to overcome the obstruction. This is seen in the stomach, when the pylorus is constricted; in the bladder, if there is any interference with the escape of urine; in the heart, when its orifices or valves are affected, or when the arteries are extensively diseased. Hypertrophy, from this cause is very frequent in connection with involuntary muscular tissue, and it may be a natural event for a certain definite purpose, of which the pregnant uterus affords an illustration. When the elements of a secretion or excretion accumulate in excess in the blood, hypertrophy of the organ or organs, whose duty it is to remove them, often ensues. This is seen in the case of the kidneys, where, if one is unable to perform its functions, the other becomes enlarged, and thus does double duty. The mammary gland also illustrates the same thing. Frequently one lung becomes hypertrophied, if the other is incapacitated from any cause.

2. It is a matter of doubt whether *excessive action of an organ due to mere nervous irritation* may not lead to hypertrophy. Palpitation of the heart, for example, is considered by some as a cause of permanent enlargement, and I have certainly met with a few cases bearing out this idea, but only very exceptionally.

3. *Excess of blood flowing to a part* may unquestionably produce hypertrophy.

4. Increase in a particular tissue may take place *from the presence of an excess of its formative elements in the blood.* This is illustrated by the large formation of adipose tissue in all parts of the body, which occurs in some individuals.

ATROPHY.

This is just the reverse of hypertrophy, meaning a waste of tissue, and it may be either "simple," "numerical," or both. Often it is associated with degeneration of tissue, and when the elements actually disappear, they must necessarily pass through a process of degeneration during removal. Atrophy may be *general*, involving all the tissues and fluids of the body, but some more than others, as is seen in old age, phthisis, cancer, &c. It may be *limited to a particular system*, such as the muscular or glandular, or it may *only affect one organ*, or *a particular tissue* in it, *e.g.*, the heart, liver, or kidney; at the same time some other tissue may increase.

Effects.—The weight is diminished, unless this is obscured by congestion, or in some other way. There is usually also a lessening in dimensions, but not invariably, and there may even be apparent enlargement. Wasted parts generally have a paler and less healthy aspect, and appear either drier and firmer, or softer, than in their normal condition. Their functions are necessarily impaired.

Causes.—1. Anything *that interferes with the proper nutritive qualities of the blood*, will give rise to general wasting to a greater or less degree. Hence it may arise from a deficiency in the quantity or quality of the food; from diseases which interfere with its digestion and absorption, as well as from direct loss of blood, and those affections which lead to the excessive removal of the nutritive elements of the blood, such as Bright's disease, prolonged suppuration, or phthisis. In cancer there is frequently an extraordinary degree of wasting, involving also the internal organs. In a case of cancer of the lung which came under my observation, the heart only weighed 3¼ ounces.

2. Combined with the foregoing cause, or acting alone, there is often *an increased waste of tissue*, which cannot be repaired, as may be seen in the case of fevers and many other diseases. In some cases this is limited to one organ, which may undergo rapid atrophy without any evident cause, *e.g.*, acute atrophy of the liver.

3. The *general vitality and nutritive activity* of the tissues may be impaired, or that of some particular part or organ, and thus general or local atrophy result. This may be the normal course of events, associated with a diminution or cessation of functions, as for instance in the case of "senile atrophy," of which it is an important element, as well as in the wasting of organs or structures, which at a certain period of life become atrophied, because their functional activity is at an end. This is exemplified by the changes which take place in the thymus gland, spleen, and lymphatic glands, at different ages. The same thing is seen in the rapid diminution in the size of the uterus after delivery. In other cases the impairment of vitality is due to some previous disease, such as inflammation, and still in others it is the result either of overuse on the one hand, or deficient exercise on the other. There can be no doubt but that, if certain organs are used excessively, they may waste, *e. g.*, the brain or testicle, while examples of the opposite condition are common enough, in the wasting of the muscles of paralyzed limbs, of bone after amputation, or of nerves after their connection with the cerebro-spinal axis has been severed.

4. An important cause of atrophy is a *deficient supply of arterial blood*, however this may be brought about, whether by something directly interfering with its passage to a part, or by overloading of the veins in long-continued mechanical congestion. To some extent this will explain "senile atrophy," the heart and arteries having degenerated, the circulation is thus interfered with. It is in the production of "local atrophy," however, that this cause mainly acts, and it may affect any part if the supply of blood is not adequate to the demand, provided it is not cut off completely, under which condition gangrene occurs.

5. *Direct pressure upon an organ*, as for instance by pericardial thickening upon the heart, may lead to atrophy. The same thing is seen in wasting of bone and other tissues, from the pressure of a tumor or aneurism. This acts partly, but not entirely, by interfering with the supply of blood.

6. It has long been known that the *nerves* influence nutrition in an important manner, and hence when paralysis of any nerve occurs, atrophy is liable to follow in the part supplied by it.

This is partly to be attributed to the resulting cessation of functions, partly to the influence thus exercised on the supply of blood through the vessels, but to some extent to the direct control which nerves possess over the process of nutrition.

7. Certain medicines when administered for some time have the power of causing the absorption of organs or tissues, and consequent wasting, such as mercury, iodide or bromide of potassium, alkalies, &c. This power is made use of to promote the removal of morbid products.

8. Lastly, some forms of atrophy occur, of which there is no adequate explanation, *e. g.*, "progressive muscular atrophy."

CHAPTER VI.

DEGENERATIONS.

STRICTLY speaking, a degeneration implies the conversion of some tissue into one less organized, which is incapable of performing properly the necessary functions. In short, it is a retrograde metamorphosis. This is considered to result either from an immediate change in the albuminoid compounds, or from a molecular absorption of the structural elements, and their replacement by others lower in the scale. The term, however, is also applied to certain pathological processes, in which a new material is deposited in the midst of the original elements of a tissue, being derived from the blood, and which may or may not lead to their absorption, or even ultimately replace them entirely. To these two kinds of degeneration, the terms *metamorphosis* and *infiltration* are respectively applied. These pathological changes are of the utmost importance, not only because they interfere with the functions of organs or tissues, but also because they give rise to conditions which predispose greatly to the occurrence of severe lesions. For instance, a fatty heart is liable to rupture; and a fatty or calcified state of the bloodvessels very frequently leads to their laceration, with consequent extravasion of blood, as well as to aneurisms. The degenerations which are met with will now be briefly considered.

I. FATTY DEGENERATION.

This includes *fatty metamorphosis*, and *fatty infiltration*, each of which requires separate notice.

1. *Fatty Metamorphosis.*—The direct conversion of the albuminoid constituents of tissues into fat is a very common occurrence, being one of the natural events of decay in old age, and it often leads to serious consequences. It may take place in connection with cells or fibres. The fat is usually deposited in a granular form, but ultimately it may accumulate into masses, or into drops of oil. The granules are recognized by their dark and distinct outline, refractive power upon light, and solubility in ether. The process will be best studied by taking individual tissues as illustrations.

Muscular Tissue.—Voluntary muscles may become the seat of fatty change, of which a marked example came under my notice in the dissecting-room of University College during the session 1869–70, where almost the whole of the muscles of the thigh on one side were converted into fat, without any alteration in their general size or shape, or in the arrangement of fibres. The subject, an old woman, had been bedridden for several years. It is in the fibres of the heart, however, that this degeneration is most frequently observed. Under the microscope, the fibres are seen at first to be somewhat dim, as regards their transverse striæ, owing to the presence of a few minute fat-granules, arranged either in transverse or longitudinal lines, or usually, in an irregular manner. Ether causes the striæ to become evident again. The increase in the number and size of the granules causes the striæ to become more and more obscure, until eventually all trace of muscular fibre disappears, and nothing is seen but fat-molecules and oil-drops, occupying its course. Where sarcolemma exists, this may ultimately rupture, and the fat be scattered about. The cells of involuntary muscular tissue are also liable to fatty change; granules gradually filling them up, and conceal-ing the nucleus, complete destruction finally taking place. The conversion of muscle into adipocere after death, is a fatty degeneration.

Bloodvessels.—The arteries are very prone to fatty degeneration as age advances, which may start as an immediate change in the cells of the inner coat, or in the muscular coat, or be associated with the condition named "atheroma," to be hereafter considered. At last the tissues may be more or less destroyed, and carried away by the blood current, leaving uneven erosions on the inner surface of the vessels. The capillaries are also apt to undergo a fatty change. The *nerve-tissues*, both cells and fibres, are subject to fatty degeneration, becoming the seat of much molecular fat, and finally breaking down. This is well seen in the different varieties of softening of the brain or spinal cord.

As regards fatty degeneration in cells, the following may be mentioned in further illustration. The so-called "compound inflammatory globules," or "exudation-corpuscles," as well as "pus corpuscles," are merely the result of the conversion of the contents of cells, either normal to the part, or which have migrated from the blood, into granular fat. A large number of these originate in cellular tissue corpuscles. In the cells of the liver, epithelium of the renal tubes, suprarenal capsules, lymphatic glands, fatty degeneration also occurs, and the "arcus senilis" is due to the same process in the cells of the cornea. Most organs in their natural decay undergo this change, and it is also exemplified in the formation of many secretions, as well as in the production of the corpus luteum in the ovary, and in the degenerative changes in the placenta, on the approach of the full period of pregnancy. Morbid growths, such as cancer, tubercle, and various tumors, are likewise capable of fatty change.

When cells become fatty, they often enlarge, and are more spherical and distended. The granules first appear at a distance from the nucleus, scattered irregularly; they then become more numerous and larger, obscure the nucleus, and finally cause it to disappear completely. The cell-wall is often ruptured or absorbed, and then there is merely an accumulation of granular fat, which frequently separates into its constituent particles, from intermediate liquefaction.

Caseation, Caseous or Cheesy Degeneration.—These terms have come into considerable prominence of late years, and are used to signify the conversion of various structures into a kind of soft, dryish, cheesy-looking substance, of yellowish color. It is due to a process of partial fatty degeneration with drying, and the material is found to consist of withered cells, fat-granules, partially saponified fat, and crystals of cholesterin. It generally occurs in connection with some morbid product, or where there is a great accumulation of cells, pressing much upon each other, and is especially met with where the vessels are few, so that the tissue is dry. Pulmonary phthisis gives some of the most frequent illustrations of caseous degeneration, but not of necessity associated with tubercle. It is also often seen in scrofulous lymphatic glands, cancer, chronic abscesses, diseased bones, &c. Ultimately a more or less creamy or puriform-looking fluid substance may be produced, or a kind of fatty emulsion, which may be completely discharged by expectoration, or in other ways, and thus the caseous matter be removed; or it may become incapsuled by some dense tissue, and finally calcify. By some pathologists this caseous material is supposed to act as a poison, and to produce tubercle, being absorbed into the blood.

Effects.—The immediate results of fatty degeneration are usually quite obvious, if it is at all marked, but in less advanced cases the microscope alone can reveal the change. There is a change in color, the affected tissue becoming usually paler, and assuming a yellowish or brownish tint; this is well seen in muscular tissue, but in some cases, as in softening of the brain, the color varies from white to red, according to circumstances. A tendency to opacity also exists. One of the most marked alterations is a diminution in the consistence of the affected part, which varies from a slight degree of softening of the structure, which breaks down under pressure, or tears more easily than in health, to its conversion into almost a fluid pulp. All vital properties, such as elasticity or contractility, are at the same time impaired or lost, as well as the power of resistance. When the process is advanced, tissues may have an oily feel, and ether will dissolve out a considerable amount of fat.

The remote consequences are very important. The functions of any organ or tissue involved must necessarily be interfered with, to a greater or less degree. Structures are also liable to give way and rupture, as in the case of the heart and vessels. With regard to the arteries, they may become the seat of aneurism, and by interfering with the supply of blood to structures, ultimately lead to their degeneration also.

Causes.—Some interference with nutrition is the immediate cause of fatty degeneration, and it may occur under either of the conditions which produce atrophy. Those which usually give rise to it are—1st. Senile decay, during which most of the tissues become degenerate. 2d. Deficient supply of arterial blood to a part, from obstruction, changes in the vessels, or external pressure. 3d. Some general disease lowering vitality, such as phthisis or cancer. 4th. Congestion, inflammation, very rapid development of a tissue, or excessive exercise of its functions, which disturbs its vitality. 5th. Possibly the presence of an excess of fat in the blood.

2. *Fatty Infiltration.*—This is an essentially distinct process from that of "fatty degeneration," there being no change in the tissues themselves necessarily, but merely an excessive deposit of fat from the blood, within the cells of the part affected, and this infiltrates the structures to a variable extent. It might, in fact, be considered a *hypertrophy of fat.* The deposit occurs in the form of oil-drops, which ultimately run together, completely obscuring the other contents of the cells, without of necessity destroying them. Ultimately the tissues may degenerate from mere pressure. The best examples of this infiltration are found in the increase of the ordinary adipose tissue met with in some individuals, subcutaneous as well as around internal organs; in connection with muscular tissue, especially that of the heart; and in the cells of the liver. In the two former instances the connective tissue cells become filled with fat. As regards the heart, the degree of the change varies considerably, from a slight increase in the ordinary fat about the organ, to a condition in which it seems to be entirely converted into adipose tissue, there being no trace of muscular fibres, or only a few scattered about, most of them having undergone true fatty degeneration from pressure, and then having been removed. This condition will be further described again. In

voluntary muscles this process may also take place, as in connection with those which are paralyzed, or otherwise rendered inactive.

In the liver the hepatic cells become more or less filled with drops of oil, which cause them to become larger and more spherical, and hide their contents.

Effects.—Fatty infiltration may produce enlargement of organs, and some alteration in form, there being a tendency to roundness of margins and general outline. The color also becomes paler, and may be just that of adipose tissue. Softening, with a doughy feel, such as is met with in ordinary fat, and evidences of the presence of much oil, either to the finger, the knife, blotting-paper, or ether, are among the principal changes observed. The functions of tissues are often more or less interfered with, but not to the same extent as in fatty degeneration, provided they have not undergone this process owing to pressure.

Causes.—1st. *Excess of fat in the blood* is a common cause of this pathological change, which is often associated with increased obesity. This results from consumption of too much fat, or of aliments which contribute to its formation, or from a deficiency in the amount of exercise taken, and general luxurious habits, or from both combined. There is also a diminution in the ordinary waste of fat under these circumstances.

2d. In some affections, attended with much emaciation, organs are prone to be the seat of fatty infiltration, especially the liver. This is best seen in phthisis, and is supposed to be due to the absorption of the general fat, and its consequent accumulation in the blood, from which it is afterwards deposited in the liver.

3d. Undoubtedly *interference with the respiratory process* may lead to fatty infiltration, because the fat is not properly burnt up, and thus its not infrequent occurrence in lung and heart affections will be partly accounted for.

4th. *Local inactivity* may be the cause of fatty infiltration, which is illustrated by the instances already alluded to, of its occurrence in connection with muscles.

II. MINERAL OR CALCAREOUS DEGENERATION.—CALCIFICATION.—PETRIFACTIÓN.

It is important to distinguish this degeneration from ossification, which term is often applied to it. There is no conversion into bone, but merely an infiltration of the tissue involved with particles of calcareous matter. These are in the form of very minute molecules, chiefly deposited irregularly between the histological elements, but partly in their interior as well. Microscopically they look like dark, opaque, irregular particles by transmitted light, and in mass have a glistening aspect. They often resemble fat in appearance, but may be distinguished by their solubility in dilute mineral acids, which is frequently attended with effervescence, and the formation of small bubbles of gas, owing to the decomposition of carbonates. The deposit occurs first immediately around small vessels, where these exist, but ultimately it may extend and form irregular patches or concretions of variable dimensions. Chemically it is made up chiefly of calcic and magnesic phosphates and carbonates, but other salts are also present, and the composition is not uniform in all structures.

Calcification is particularly prone to occur in tissues which have lost their vitality, and which have previously undergone other forms of degeneration, especially the fatty. It is in fact very frequently the final stage of degenerative change, after which no further alteration can take place. Among its most common seats must be mentioned the *arteries*, and the *valves* and *orifices of the heart*, and it is in connection with these structures that its most injurious effects are produced. It occurs, however, in many other tissues, viz., in fibrous, or fibro-serous membranes, *e. g.*, the pericardium, dura mater, tunica albuginea, &c.; in the walls of hollow organs, such as the gall-bladder, or stomach; in the pia mater and choroid plexuses of the brain, constituting "brain-sand;" in cartilage, muscle, and nerve tissues; in various organs and glands, such as the kidneys, lungs, absorbent glands, thyroid, prostate, and pineal gland; in connection with different morbid products, as tubercle, cancer, inflammatory exudations, fibrinous deposits from the blood, chronic abscesses, and tumors of all kinds.

Effects.—The deposit of calcareous matter necessarily produces hardness, stiffness, roughness, and rigidity, often combined with brittleness. There is a gritty sensation on section, and when it affects membranes they can frequently be broken up with a crackling noise. In some cases stony masses are formed of some size. Now and then a kind of chalky fluid is produced, or a substance like cement. The most injurious consequences result from the change in size and shape of structures, the roughness and interference with free movement and with the functions of elasticity and contractility, and the brittleness which it produces. Thus, in the case of arteries, it narrows their calibre, makes them rough and rigid, destroys their elastic and muscular tissue, and renders them prone to be easily ruptured. Hence it leads to insufficient supply of blood to parts, with consequent atrophy or gangrene; also to the formation of internal clots, or to extravasations of blood and hemorrhages. In connection with the valves and orifices of the heart, it causes serious obstruction and interference with their normal functions. In some cases, however, calcification is distinctly a favorable result, and indicates the cessation of injurious morbid processes. It is, in fact, a practical cure, and the calcified substance may remain for many years inert, not causing any disturbance. This is well seen in connection with phthisical deposits, and scrofulous lymphatic glands. A case fell under my notice some years ago, where in a highly scrofulous young man, aged 21, the whole of the glands in the abdomen were converted into calcareous masses, and had evidently been in this condition for many years, without leading to any inconvenience, the patient dying from quite an independent acute illness.

Causes.—1. Calcification is usually associated with *deficient vitality*, and *a lowering of the nutritive activity*, either general, such as occurs in advanced age, or local, such as is met with in connection with morbid products, and is dependent upon an insufficient supply of blood, with slowness of its circulation. As already stated, it is frequently the termination of other atrophic and degenerative processes. With regard to the immediate cause of the deposit, it is supposed to be due partly to the inability of the tissues to take up the nutritive fluid, including its salts, partly to the precipitation of these, because the carbonic acid, which holds them in solution, escapes, owing to the stagnation of the fluids.

2. Occasionally calcification is due *to the presence of an excess of salts in the blood.* This may arise in connection with diseases of bones, such as mollities ossium, extensive caries or necrosis, in which their salts are rapidly absorbed, and "metastatic deposits" occur in other parts, involving often many structures and organs. An interference with the urinary secretion may also lead to this condition, the salts not being removed, and when this happens the kidney is particularly apt to be the seat of deposit.

III. Fibroid Degeneration.

Tissues are sometimes gradually changed into a tough, inelastic material, made up of imperfect fibres, like those of fibrous tissue. There is no apparent exudation to any extent, but a hyperplasia of the cellular-tissue elements occurs. The affected part is more or less opaque, whitish, thickened, and stiff, sometimes being hard and rough. The fibro-serous and serous membranes often present this change, in the form of thickened patches, such as are well seen in connection with the pericardium. The coverings of organs, as that of the spleen or liver, are also frequently affected by it, as well as the sheaths of vessels. It is likewise met with in the cardiac valves, tendinous cords, and muscular tissue, interfering much with their functions, and it may end in calcification. It results from pressure and friction, from repeated traction, or from long-continued congestion sometimes. It is not always easy to draw a line between the effects of this process and those of chronic inflammation, and some pathologists consider that the latter has always occurred where this change is met with.

IV. Pigmentary Degeneration. Pigmentation.

General or local changes of color in tissues may occur from various causes, such as jaundice or local staining by bile, the bronzed skin of suprarenal disease, the color due to the action of the intestinal gases, or those set free in mortifying parts, and that produced by the prolonged administration of nitrate of silver. What we are considering, however, at present, is the deposit of actual pigment in connection with various textures; and it is necessary to discuss the origin, nature, and characters of the different kinds which may be met with.

1st. In the great majority of cases in which pigment is found, it originates in the coloring matter of the blood, which undergoes certain changes. This may be present in some localized part, either from its mere transudation through the coats of the vessels, from the migration of red corpuscles, from actual hemorrhage having taken place, or from capillary stagnation. At first it is diffused, and stains the tissues, especially the cells, coloring the contents, but leaving the nucleus and envelope unaffected. After a while the color changes, becoming of various tints, such as yellow, yellowish-brown, brown, reddish-brown, dark-brown, gray, or black; this depending much upon the length of time the pigment has existed, and the tissue in which it is present. At the same time it separates into minute molecules or crystals, or both, which are found within or outside the cells. The former may aggregate into large granules; they are round or irregular in shape, well defined, opaque, or sometimes glistening in appearance. The crystals are in the form of minute oblique prisms, needles, or plates, which vary in color from yellow, through red or brown, to black, and present a shining aspect. These particles are very persistent, they resist the action of acids, and are not subject to destruction. Water, alcohol, and ether do not affect them, but they are dissolved by strong alkalies, forming a red solution, while concentrated mineral acids produce a series of changes of color. Chemically, the pigment is supposed to consist of "hæmatoidin," but when it becomes black it is named *melanin.* Examples of these changes in blood-pigments are frequently met with in connection with cerebral apoplexy, in pulmonary congestions or hemorrhage, in subcutaneous extravasations, and in the formation of the "corpus luteum" in the ovary. The alterations in the color of the "rusty expectoration" of pneumonia, as the case progresses, are due to the same cause. In certain affections the blood itself contains corpuscles, inclosing a quantity of black pigment. This occurs in the rare disease called *melanœmia*, as well as after prolonged attacks of ague, in which the spleen becomes enlarged, and contains an abundance of the same pigment, supposed to be absorbed into the blood. It is, however, originally derived from the blood-pigment. The same condition is observed in melanotic tumors. Occasionally the minute portal vessels of the liver become filled with black pigment.

In some instances pigment is supposed to be directly formed and secreted in certain cells, but here again the blood must be looked upon as its ultimate source. This is especially presumed to occur in growths connected with tissues which normally contain much pigment, such as the choroid coat of the eye.

2d. An important source of pigmentation in connection with the lungs and bronchial glands, is the inhalation of certain substances, along with the air breathed. All persons are constantly inhaling small particles of carbon, the result of imperfect combustion, and this occurs especially in large towns and manufacturing districts. Hence it is found, that the lungs become darker as age advances. It is, however, in the lungs of those who, owing to their occupation, are exposed to the constant breathing of air containing various minute particles suspended in it, that the most marked alterations are produced. Colliers inhale fragments of coal, and their lungs become ultimately perfectly black. Miners, stonemasons, and others are also subject to change in color from the same cause.

The carbon or coal exists in the form of minute granules, which resist all chemical change, and these, after entering the small bronchi and air-cells, somehow penetrate the tissues, passing into the epithelium-cells, as well as into the tissue between the lobules and around the bronchi, where they lie either free or inclosed in the connective tissue corpuscles. They are taken up by the lymphatics, and conveyed to the bronchial glands, which soon become quite black also. In the matter which is expectorated, abundant pigment is seen within the cells which it contains, and the sputa may be perfectly black. The change of color in these cases is, however, not believed to be entirely due to the direct deposit of matter from without, but partly to the irritation caused by this setting up inflammatory processes, with stagnation of blood, the pigment of which undergoes the usual alterations.

V. Mucoid Degeneration.

Some tissues occasionally undergo a process of softening or liquefaction, to which this term is applied. They become changed into a mucilaginous substance, colorless and homogeneous, which yields *mucin.* In fact, they seem to return to their original fœtal condition. The change may take place extensively, or in limited spots, where, being surrounded by healthy tissue, it may produce an appearance of cysts. The intercellular tissue is most affected, but sometimes the cellular elements become involved in the degeneration. It is met with in cartilages, bone, serous membranes, and in the choroid plexuses of the brain. Some tumors are of a "mucoid" structure when first formed, and many others may undergo this change more or less.

VI. Colloid Degeneration.

The substance formed in this change is of a jelly- or glue-like consistence, glistening, transparent, and devoid of color. It is derived from the albuminoid tissues, and differs from "mucin" in that it has sulphur entering into its composition, and in not being precipitated by acetic acid. It also affects the *contents of the cells* themselves, and not the *intercellular substance.*

Ultimately it may form considerable masses, from coalescence, which often appear to be contained in cystic cavities. New growths sometimes start as "colloid tumors," and other tumors are liable to the change. Formerly all "colloid tumors" were looked upon as of the nature of cancer, but it is now recognized that non-malignant tumors may be the seat of this degeneration. Enlarged thyroid glands and lymphatic glands occasionally contain this material.

VII. LARDACEOUS DISEASE.—ALBUMINOID INFILTRATION.—AMYLOID DEGENERATION.—WAXY DISEASE.

By these names, among others, a very important morbid condition of organs and tissues has of late years been described. Much has yet to be ascertained with regard to it, but the following account may convey a tolerably correct idea as to the present state of knowledge on the subject.

(1.) *Characters of the Substance and Objective Changes in the Tissues Affected.*—The disease consists in the infiltration of a material, which appears quite structureless and homogeneous, and at first nearly transparent. This is said to give certain characteristic chemical reactions. When a watery solution of iodine is applied to the affected tissue a deep reddish-brown color is produced, but this by no means always occurs, even when the change is advanced, and it may be more useful as indicating a slight degree of the infiltration, especially when applied to microscopic sections. The subsequent addition of a drop of strong sulphuric acid is stated to give rise to a violet or dark-blue color. It may undergo a granular or fatty degeneration, and it is also said that it tends to contract and be changed into fibrous tissue. When an organ or tissue is much affected, it presents certain striking characters. The organ is enlarged, sometimes to a great degree, but without any irregularity in form, the surface being quite smooth and the margins inclined to be rounded; the weight is proportionately increased, the specific gravity is high, and the organ feels heavy, solid, and firm. It may be cut into regular fragments, quite smooth, and with sharp margins, or very thin slices may be removed. It may also be torn into pieces, and the consistence is peculiar, being a combination of toughness and resistance, with elasticity, resembling somewhat that of wax, or wax and lard combined (hence the names "waxy" and "lardaceous"). A section is dryish, paler than normal, and presents a glistening and translucent aspect, being quite smooth, uniform, and compact. In many instances, however, the infiltration may not have taken place to the extent of altering much the general physical character of organs; and it may be limited to the vessels or to certain spots, as is well seen in the so-called "sago-spleen," where it is confined to the malpighian corpuscles. The minute arteries and capillaries are almost always first affected, and the infiltration begins in the muscular coat. The walls become thickened, the channel is narrowed, and on section the vessels remain open, at the same time they assume a compact, translucent, shining appearance, looking like silvery cords or threads. After a time the material extends to the cells and intercellular tissues, enlarging the former and making them more spherical, at the same time displacing their normal contents, the nucleus being destroyed. They then coalesce, and the whole structure presents finally the peculiar glistening appearance. It is supposed by some that the substance makes its way directly through the walls of the vessels, and then into the tissues around.

(2.) *Nature and Origin.*—Various theories have been held respecting the nature of this substance. It has been by many considered to be allied to starch or cellulose (hence the term "amyloid"); others believed it to be a form of cholesterin. The view most commonly adopted is, that it is an albuminoid substance, its ultimate analysis supporting this, it being a nitrogenous compound. Dr. Dickenson considers it to be *dealkalized fibrin.* With regard to its origin, it has been looked upon as some *local degeneration* or *metamorphosis* of albuminous tissues, but this is probably not correct. Most pathologists consider that a *direct deposit* from the blood takes place, in consequence of some alteration in this fluid, which occurs under certain circumstances. Nothing of the nature of this albuminoid substance has, however, been detected in the blood, and therefore it is probably modified after it escapes from the vessels. Dickenson thinks it is merely that the fibrin is deprived of its alkali, and is then deposited. The disease is a general one with local lesions.

(3.) *Organs and Tissues Affected.*—Any part or structure may be implicated, and usually several organs are involved in the morbid condition. The liver, spleen, kidneys, and absorbent glands are most subject to it, but other structures are also attacked sometimes, such as the stomach and intestines (of which I have lately seen two well-marked instances), the suprarenal capsules, bones, and muscles, the brain and cord and their membranes, the tonsils, serous membranes, the bladder, &c. It also affects morbid deposits in connection with inflammation, tubercle, or cancer. In some cases, when it follows disease of bones, it begins in the neighboring lymphatic glands, and this is considered by some as an argument in favor of its local origin in degeneration.

(4.) *Causes, and Diseases with which it is associated.*—This affection is almost invariably brought on by some previous disease, which in the great majority of cases is attended with *long-continued and excessive suppuration,* but this is certainly not absolutely necessary, for in the worst case that ever came under my notice there had been no suppuration. The separate conditions under which it may be met with are—(*a.*) In cases of caries and necrosis of bones, and in rickets. (*b.*) After syphilis, especially if attended with much suppuration, and disease of bones, or if much mercury has been given. Children who are congenitally syphilitic may be the subjects of albuminoid disease. (*c.*) In chronic pulmonary phthisis, with much purulent expectoration, as well as in other lung affections attended with this symptom. (*d.*) In chronic empyæma. (*e.*) In extensive ulceration of the intestines. (*f.*) After prolonged ague, or malarial influence. (*g.*) In pyelitis and some other kidney affections.

(5.) *Clinical History and Symptoms.*—Only a few general remarks will be made here, as the symptoms will again be pointed out, in connection with individual organs. It is not always easy to make out what symptoms are due to the original affection, and what to the albuminoid disease. Nutrition is impaired, and the patient is emaciated, often extremely so, at the same time becoming pale and anæmic, with a peculiar transparency of tissues, or presenting a waxy look. There is great debility in many cases, with a tendency to syncope. Œdema of the legs occurs from weakness and anæmia. With regard to the various organs, they are frequently obviously enlarged, and present well-defined characters to physical examination. Their functions are also interfered with more or less.

(6.) *Treatment.*—This must be directed to the cause of the disease, by putting a stop to suppuration, &c.; at the same time the general health must be improved by *diet, hygienic measures,* *tonics*, *iron*, and other remedies indicated in different cases. The use of syrup of iodide of iron is certainly often attended with considerable benefit, if persevered in for some time.

CHAPTER VII.

FEVER, OR PYREXIA.

THE symptoms which indicate the presence of "fever" are so commonly met with, that it is of great importance to have clear and intelligent views with regard to this condition in the abstract, before considering it in relation to any special disease.

The cases in which "fever" occurs are grouped under two distinct classes, viz.:

(1.) It may follow, and be the result of some local lesion in a tissue or organ, especially inflammation, when it is termed *secondary*, *symptomatic*, or merely *pyrexia*, *fever*, or the *pyrexial state*. The fever attending pneumonia will serve to illustrate this group.

(2.) The symptoms of fever may constitute the chief and primary deviation from the normal state, not being due to any evident local cause, and if any special organ or tissue becomes affected, this occurs secondarily. *Idiopathic*, *essential*, *primary*, or *specific* are the terms applied to fever under these circumstances, or it is simply called *a fever*. It originates from the presence of some morbid poison in the blood, introduced from without, or produced within the body. The acute specifics and rheumatic fever afford instances of this class.

It will be convenient to consider first the general characters of fever, and then to point out certain peculiar forms that are met with.

(I.) *Essential Phenomena and Symptoms.*—1. *Rise in Temperature.*—This is now looked upon as the only absolutely necessary sign of fever, and if excessive heat exists, a febrile state is considered to be present. It may be evident in the aspect or sensations of a patient, or the skin may feel hot to the touch; but no reliance is to be placed on these sources of information, and recourse must be had immediately to the use of the thermometer, if pyrexia is supposed to be present. The temperature may range from only just above the normal to 108°, 110°, or even above 112° Fahr., but it does not commonly exceed 105° or 106°. It may continue to rise for some time after death.

2. *Alterations in the Secretions.*—As a rule secretions are *diminished in quantity*, owing to the deficient elimination of water, and its retention in the system. From this result some prominent symptoms, viz., (*a.*) *Dryness and roughness* of the skin, though this is not always present, in some cases there being profuse perspiration. (*b.*) *Derangements of the alimentary canal.* The salivary, gastric, and intestinal secretions are deficient, hence the tongue is furred and the mouth clammy; there is much thirst, but no inclination for food, and the bowels are constipated. Nausea or vomiting not unfrequently occur. (*c.*) The *urine* is much diminished in quantity, high-colored, very acid, with a strong odor, and high specific gravity. This secretion, however, exhibits other alterations generally, in that it contains an excess of its organic nitrogenized constituents, especially *uric acid* and *urea*, and a much larger quantity of these substances is secreted than in health, during the twenty-four hours. There is also an increase in hippuric acid, sulphates, phosphates, and coloring matters often, but not always. The alkaline chlorides are commonly deficient, and may be absent altogether.

3. *Changes in the Circulatory and Respiratory Systems.*—The pulse is increased in frequency, and may rise to 120, 140, or more, being, as a rule, in proportion to the temperature. In its other characters it varies greatly in different cases. In long-continued or severe cases it may become very weak, irregular, or intermittent; these characters being associated with feeble action of the heart. The sphygmograph is very useful in indicating the state of the circulation when fever exists.

The *blood* is altered in composition, there being a diminution in the amount of alkalies and in the alkalinity of the serum; and after a time the albumen and red corpuscles also become deficient, while the white corpuscles are often increased in number. In some forms of fever the fibrin is much above the normal quantity, in others it is greatly reduced.

The *respirations* are usually quickened in proportion to the pulse, or, according to some observers, the ratio is always disturbed, the respirations being in excess. With regard to the elimination of carbonic acid, the balance of opinion is, that this is increased on the whole, owing to the more frequent respirations.

4. *Disturbances of the Nervous System.*—When fever exists, there are generally symptoms referable to the nervous system. In the early stage, chills or rigors are often experienced, with general pains or soreness, and a feeling of exhaustion, languor, and inaptitude for any occupation or effort. Some fevers present special localized pains, and headache is a very frequent complaint. Restlessness, insomnia, and slight nocturnal delirium are common symptoms. Under certain circumstances there may be very serious nervous disorder, indicated by great prostration; delirium, either violent or muttering; somnolence or stupor, tending to coma; and muscular disturbance, such as tremors, subsultus tendinum, picking at the bedclothes, or convulsions.

(II.) *Modes of Termination.*—Such being the symptoms observed, to a greater or less degree, when fever exists, we have next to consider how it may terminate, supposing recovery to take place, or, in other words, how *defervescence* may be brought about.

1. *By Crisis.*—When this occurs there is a sudden or rapid abatement of the fever, indicated by a marked fall in temperature, which may become normal in a few hours; at the same time there is generally a considerable increase in the various excretions, indicated by copious perspiration, a free flow of urine, containing a large amount of solid ingredients, or watery diarrhœa. In some cases hemorrhage occurs, such as epistaxis.

2. *By Lysis.*—By this term is meant a gradual defervescence, the temperature subsiding slowly and regularly for some days, and there being no critical discharges.

3. *By a Combination of Crisis and Lysis.*—Here there is a rapid fall to a certain extent, followed by a gradual lowering of tempe-

rature, or for some days a regular alternation of high and low temperature takes place.

4. Occasionally defervescence is quite irregular in its progress.

During convalescence the temperature and amount of excretions are often below the standard.

(III.) *Types of Fevers.*—The symptoms described as belonging to fever, are very variously combined, and present a great range in their severity as well as in their course. Hence certain types are recognized.

(A.) *Types depending upon the Course and Mode of Progress of the Symptoms.*

(*a.*) *Continued.*—This group comprehends all fevers which run a tolerably regular course, without any marked difference in temperature at different periods of the day.

It includes the acute specific fevers (small-pox, scarlatina, &c.), and most of the cases in which fever accompanies inflammation. In these the temperature rises more or less rapidly up to a certain point, then remains stationary for a time, and, finally, defervescence occurs in one of the ways already mentioned.

(*b.*) *Remittent.*—Here there are marked remissions in the fever, as indicated by the temperature and other symptoms, followed by exacerbations. This variety is met with chiefly in tropical climates, but remission is also an important character of "hectic" fever.

(*c.*) *Intermittent.*—This type is characterized by complete cessation of all febrile symptoms, which only come on at certain regular intervals, and run through a definite course, the temperature in the meanwhile being quite normal. The different forms of ague afford examples.

(*d.*) *Relapsing.*—In some forms of fever, after an attack of the "continued" type, defervescence and apparent recovery takes place, but this is followed after some days by a relapse, which event may occur more than once. Several epidemics of this character have prevailed in this country during the last few years.

(B.) *Types depending upon the Severity and Combination of Symptoms.*

(*a.*) *Simple.*—This form is the simplest expression of fever, presenting the characters already described, but not in any great severity. It is well exemplified in ordinary "febricula."

(*b.*) *Inflammatory.*—As the name suggests, this type is the one which is usually associated with local, acute inflammations, at all events at the outset. It must be mentioned, however, that this variety does not necessarily accompany every inflammation, nor does the fever always bear a proportion to its intensity and extent. It is more likely to be present when some tissues are affected than others; also in young, and plethoric persons, and in those of a sanguine temperament. The symptoms are well marked, though varying much in intensity, and are of a sthenic character. Shivering, or distinct rigors mark the onset, followed by considerable reaction. The temperature is high, the skin feeling hot and dry. There are pains in the limbs, and much headache. Vascular excitement is high, as shown by a frequent, strong, and full pulse. The blood contains an excess of fibrin-forming materials, and exhibits the "buffy coat." The digestive organs are much disturbed, there being a thickly-furred, but moist tongue, disagreeable breath, great thirst, total loss of appetite, and constipation. The urine is distinctly febrile. There is much restlessness, and sleeplessness, with nocturnal delirium; occasionally severe nervous symptoms usher in the attack, especially in children, such as convulsions or delirium.

(*c.*) *Hyperpyrexial.*—Here the temperature is very high, varying from 107° to 112°, or more. It shows a tendency to ascend very rapidly, being associated with most serious symptoms, referable to the nervous system and lungs, and the case is prone to end fatally in a short time. This type is most frequently met with in acute rheumatism and sunstroke, but may occur in other febrile conditions, such as pneumonia.

(*d.*) *Low Types.*—Under this group may be included the following:

(i.) *Asthenic,* or *Adynamic.*—The patient is very weak, and feels much prostrated. The temperature is only slightly raised, and the pulse is feeble and small, though accelerated. In short, febrile reaction is not prominent. At the same time there is not much thirst, and the tongue continues moist. Usually brain symptoms are not present, but there may be nocturnal delirium.

(ii.) *Typhoid*, or *Ataxic*. "*The Typhoid state.*"—This presents some important distinctions from the former. The tongue tends to become dry, and covered with a brown or black crust; the teeth and gums at the same time presenting "sordes." The heart's action is much impaired, as evidenced by the characters of its impulse and sounds; by the pulse, which is very weak and compressible, often irregular or intermittent; and by the tendency to capillary congestions in dependent parts, leading to low inflammations. Cerebral symptoms are prominent, especially low, muttering delirium, muscular tremblings and twitchings, and stupor, ending in coma.

(iii.) *Malignant.*—In some cases the symptoms are of such a low type, being attended with hemorrhages and petechiæ, that they may be truly termed malignant. The terms "putrid" or "septic" are sometimes applied to fever under these circumstances.

Another form of "malignant" fever is that in which some poison seems to act on the system so violently, as to knock down a patient at once, without producing any evident reaction, or any local lesions. This occurs sometimes in connection with the exanthemata.

(*e.*) *Hectic.*—This is usually associated with profuse suppuration, but may attend any great drain upon the system. Phthisis frequently presents it in its most typical form. It is of a distinctly intermittent or remittent type, and the exacerbations usually occur once in the twenty-four hours, occasionally twice. It comes on very gradually, there being at first only a slight evening rise in temperature, and quickening of the pulse; after a while the fever becomes more or less constant, but a marked increase takes place towards the evening, beginning with chilliness, or rigors, followed by much heat of skin, which increases up to, or beyond midnight, and is succeeded by profuse sweats, so that the patient's clothes and the bed-clothes become saturated.

The subjective sensation of heat is very great, and the palms of the hands, and soles of the feet, feel burning. The appearance of the patient is often very characteristic and striking, there being a beautiful circumscribed, bright-red, or pink spot on the cheek, well known as the *hectic flush.* The pulse is very easily excited, and made quicker; during the paroxysms it may rise to 120 or more. It varies in its characters, but is generally jerky, moderately soft, and compressible. The respirations are hurried. This fever is attended with rapid and great emaciation, and the patient feels much exhausted after each attack, becoming ultimately exceedingly feeble. The mind is unaffected until near the close of life, being often, in fact, peculiarly lively and brilliant. The duration of this type of fever is very variable, but tends to be prolonged.

(IV.) *Pathology.*—We come now to consider the origin and nature of fever, and to endeavor to explain the various events which occur in its course. As already indicated, pyrexia may be set up by some poison in the blood, or by some local irritation. It is believed by many pathologists that the first action is on the nervous system, especially the sympathetic and pneumogastric, a disturbance of the general vaso-motor nerves being produced either directly by the poison, or reflexly through irritation of the sensory nerves from an inflamed part. Others think that the blood and tissues are immediately affected, and that even in inflammation the local contamination of the blood disturbs the condition of the whole mass. It is probable, however, that the nervous system is first implicated, as this is known to exercise an important influence on the nutritive processes. Whichever way it begins the immediate result is a *destruction of the tissues,* in excess of what normally occurs, and from this follows most of the phenomena which are met with in the febrile state. In health the structures of the body do not undergo much metamorphosis, the food yielding the elements, by the decomposition of which animal heat is sustained; but in fever they become quickly destroyed, and changed into various substances of lower chemical composition. This destruction involves not only the fat, but also the albuminous or nitrogenized tissues, and hence the muscles rapidly waste, both voluntary and involuntary, their fibres presenting an appearance of granular degeneration under the microscope; the nerve-centres, ganglia, and nerves also atrophy; the bones become lighter, and the red blood-corpuscles are diminished in number. It is found, however, that the glandular organs do not become smaller, being indeed often enlarged from congestion, especially in young and healthy persons. This is particularly seen in the spleen, lymphatic glands, and liver, their cells also becoming enlarged and granular.

The substances into which the tissues are converted are chiefly those produced in health, only formed now in excess, viz., urea, uric acid, carbonic acid, &c. Intermediate products of decomposition may, however, be formed, some of which probably are quite foreign to the body in a state of health. As to the place where the change occurs there is no certainty. Some consider that it is in the tissues themselves; others that the albuminous elements break down into a circulating albumen, which in the blood becomes changed into lower substances, such as urea, &c. The consequences of this destruction of tissue are of the greatest importance, and will now be adverted to.

1. *Increase of Temperature.*—It is well known that animal heat is produced by the chemical and vital changes which occur in health in the blood and tissues, during which various substances undergo oxidation, or combustion. These changes account principally for the rise in temperature in fever, being carried on in an abnormal degree. Hence it is found as a rule that the temperature is in proportion to these destructive processes, as evidenced by the quantity of materials eliminated by the various excretions, as well as in other ways. It must be remembered, however, that the animal heat is influenced by the amount of perspiration, which, being usually more or less suppressed in fever, will explain partly the increased temperature.

According to Dr. Beale, however, the increased temperature in fever is not accounted for in this way. He believes that there is a great increase in the bioplasm of the blood, blood-vessels, and tissues, and that this is the cause of the excessive heat. He further states that *insufficient oxidation* of tissues occurs, as a result of which the blood becomes loaded with noxious materials, which the excretory organs cannot remove, and this condition of the blood is favorable to the growth of the bioplasm.

2. *Excessive Excretory Elimination.*—The materials formed by the unusual metamorphosis of tissues generally pass off in the excretions, and consequently there is an abnormal quantity of the solid constituents of the urine discharged, especially urea and uric acid, and an increase in the amount of earbonic acid exhaled. It may be stated that there is, as a rule, a relation between the temperature and the amount of excretion, especially that of the urea, but this is not always the case, so that the one cannot be made a measure of the other. In some cases there is little or no increased elimination during the progress of the fever. This is explained by the retention of the products of metamorphosis in the blood, owing partly to their great abundance, or to the transformation being incomplete, substances being produced which the kidneys will not remove; partly to some condition of the excretory organs, which interferes with their functions. In these cases it happens that *critical discharges* are most likely to occur at the close of the fever.

3. *Results of Deficient Elimination.*—If the products of decomposition are not discharged, serious consequences are liable to ensue.

(*a.*) The *typhoid* type of fever is usually looked upon as resulting from the poisonous effects of retained products of metamorphosis. The circulation of these through the various organs and tissues, especially the nerve-centres, causes the low symptoms observed. The nervous symptoms have, however, been also referred to the direct action of some fever poison upon the nerve-centres; to excessive temperature; or to the plugging of the minute vessels of the gray matter with white corpuscles.

(*b.*) *Secondary Inflammations.*—Unquestionably these are due to the irritative action of the products of destruction of tissue circulating through the various organs.

4. *Emaciation, Debility, and Prostration.*—These conditions naturally result from the waste of the tissues, and are in proportion to the rapidity with which they are destroyed. At the same time, very little food is taken to make up for the destruction, and even this is not easily assimilated.

5. *Effects on the Circulatory System.*—In the early stage, the heart is excited; but as the fever advances it becomes greatly impaired and disturbed in its action, for several reasons. The muscular fibres themselves undergo degeneration, as before mentioned; the organ is supplied with impure blood, and its nervous stimulus is imperfect. As a result, we find the changes in the pulse, and the tendency to hypostatic congestions, these being also directly contributed to probably by the abnormal condition of the vessels, tissues, and blood, and by the excessive growth of bioplasm, which tends to block up the capillaries.

Such are the main points in connection with the pathology of fever. There is no adequate explanation of another fact observed, viz., *the retention of water in the system.* It has been supposed that some material forms in the blood, such as gelatine, which has a strong affinity for water, but there is no proof of this.

Prognosis.—This must necessarily depend greatly on what the fever is due to, and will be considered in treating of individual diseases; there are certain conditions, however. which always increase the gravity of the prognosis, viz.:

1st. *Its Intensity.*—The higher the temperature, the more dangerous is the case; and very rarely has recovery taken place when the temperature has risen above 107°. Some recent cases, however, give reason for hope that, by energetically carrying out a certain line of treatment, many patients might be saved, even though the temperature should become much higher than this. 2d. *Its Type.*—All the low forms of fever are very serious, and any tendency to typhoid or adynamic symptoms, especially those affecting the nervous system, is to be looked upon with anxiety. 3d. *Defective elimination* is a bad sign, especially if associated with a very high temperature. 4th. *The previous State and Health of the Patient.*—Young, robust, and plethoric persons are often more severely affected than those in opposite conditions. Some diseases, such as gout, increase the danger; while the presence of disease of organs, especially of the kidneys and heart, makes a case exceedingly grave.

Treatment.—The management of cases of fever is often a matter of much difficulty, and requires the most careful and constant attention. It will depend to a great extent on the cause and nature of the fever, and whether it is primary or secondary, but each special case must be treated on its own merits. There are two rather prevalent errors to be guarded against. First, it must not be imagined that treatment is of no avail in fevers, and that the physician has nothing whatever to do. By *judicious* interference, it is possible to avert death, to relieve symptoms, and even to hasten recovery in some cases. On the other hand, *over-active* and *meddlesome* treatment is most injurious, and is to be decidedly deprecated, especially in the case of those fevers which must run a definite course. The practice of endeavoring to *cut short* fevers, has, unquestionably, often done much harm.

So far as the *pyrexial condition* alone is concerned, the indications for general treatment, and the means of carrying them out, are briefly as follows:

(1.) *To Diminish the Temperature, if this tends to be Excessive.*—One of the most powerful means towards this end which we possess is the *external application of cold.* This acts partly by increasing the elimination by the skin, but also probably by checking destruction of tissue, or, as Dr. Beale thinks, by diminishing the growth of bioplasm. The modes of applying cold are various, viz., by sponging the surface of the body with water, either tepid or cold; by cold affusion or douching, which may be practiced while the patient is in a warm bath; by wet-packing in a sheet; by the use of cold baths; by the application of ice bags; by injecting iced water into the rectum; or by placing the patient in a warm or tepid bath, the temperature of which is then gradually reduced by the removal of the warm, and addition of cold water, or even ice, which is sometimes applied to the head, spine, chest, or abdomen at the same time. After being kept in the bath for a variable time, according to circumstances, the patient is dried and removed to bed, and it may be necessary to apply hot bottles to the feet. It is often requisite to repeat the bath, even several times, and to apply ice in the intervals. With regard to the employment of these modes of treatment, the only one which is called for in ordinary cases is the sponging of the surface, which is often decidedly beneficial, and gives much relief, while it is not at all dangerous, if proper care is exercised. It is, however, in those cases where the temperature becomes *very high*, and shows a tendency to rapid ascent, that cold is so extremely valuable. The cases recently treated and recorded by Dr. Wilson Fox, prove conclusively the wonderful effects resulting from the use of cold in the manner last described, when there is great hyperpyrexia. Undoubtedly, under similar conditions, it would be not only advisable to follow the same treatment; but this is the *only method* that seems to offer any chance of recovery.*

Bleeding has been employed with the view of lowering fever, but there is positive evidence that it acts most injuriously, and therefore should never be done with this object in view, although in the inflammatory variety it may be required. Among medicinal agents, aconite, digitalis, veratrum viride, and antimony are, in appropriate cases, very useful in fevers. They reduce the temperature to some degree, but have also a striking effect on the pulse, diminishing its frequency. Some of them act also on the excretory organs.

Quinine is much used for the purpose of lowering temperature or checking its ascent. It is well known to have a powerful effect upon ague, and when given in considerable doses, it appears to have some power of diminishing the heat. Five, 10, 15, 20 grains, or even more, are given at variable intervals, according to circumstances, and its administration may be combined with the application of cold.

Sulphurous acid, in drachm doses every two, three, or four hours, has been recommended.

(2.) Another important indication is to *watch the excretions*, and observe whether proper elimination is taking place. Some advocate strongly energetic eliminatory treatment in fever, by which they propose to get rid of any morbid poison, as well as of the products of destruction of tissue. This, however, is not advisable as a general thing, except in so far as it may be necessary to keep the bowels freely open, and to give some mild diaphoretics and diuretics; but it is requisite in severe cases to examine the excretions, especially the urine, and ascertain if the materials are being properly removed, and, if they are not, to adopt measures that will aid their discharge. If symptoms arise indicating that the system is being poisoned by the accumulation of urea in the blood, energetic eliminatory treatment is decidedly called for. This consists in measures that will promote the free action of the skin, bowels, and kidneys. Diaphoretics and diuretics are very useful, such as saline mixtures containing citrate of potash or ammonia, or liquor ammoniæ acetatis, along with the free use of diluent drinks. The employment of baths, as already described, increases the skin action. In severe cases, where the urine is deficient, it may be necessary to endeavor to excite the kidneys into activity by hot fomentations or poultices over the loins, mustard poultices, or dry cupping. Purgatives must be employed with caution, as they are likely to weaken the patient, but they are often required, and the saline aperients are the best. When diarrhœa exists, some advocate that it should be permitted to continue, or even aided by medicines, as it is a natural mode of elimination of a poison. It certainly is not well to check it in all cases; but if it is excessive, and the patient is becoming much weakened, it is, in my opinion, decidedly advisable to diminish it by appropriate remedies.

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* For further details on this subject the reader is referred to the valuable observations of Dr. Wilson Fox, in his contribution on Hyperpyrexia.

(3.) One of the most necessary and difficult parts of the treatment in many cases is the *administration of proper diet*, including food and alcoholic stimulants, *in a proper manner*. The food must be nutritious, and capable of easy assimilation. Milk is a most valuable article of diet, as well as beef tea, chicken broth, eggs, &c. A most important matter to attend to, is to give the food at *frequent and regular intervals*, in *definite* and *moderate quantities*, and a patient should not be allowed to sleep for too long a time, and thus be deprived of nutriment. It is quite impossible to lay down any definite rules, as each case must be treated on its own merits. In the low forms of fever large quantities of nutriment are called for.

With regard to *alcoholic stimulants*, they are by no means always required, and their indiscriminate use may do a great deal of harm, but in a large number of cases they are very valuable, though much experience is necessary to determine what form to give, and what amount, under different circumstances. Wine or brandy generally answers best, of which it may be necessary to give very large quantities, and it is astonishing how much may be taken in certain cases without producing the ordinary effects of alcohol. It is most important that they should be administered at regular intervals and in definite doses. The essential value of alcohol consists, not in its making up for food, which must be given at the same time, but in that it maintains the action of the heart while the system is struggling against the fever, hence the chief indication for its use is to be found in the condition of this organ, as shown by its impulse and sounds, by the state of the pulse, as regards its frequency, force, and amount of tone, and by the condition of the capillary circulation. Other organs, however, must not be overlooked, and in judging of the effects of the administration of stimulants, attention must be paid as well to the tongue, skin, respiratory organs, and nervous system. Their good effects are seen in the tongue becoming moist and less furred, the skin perspiring, the temperature reduced, the number of respirations diminished, and the nervous system calmed. If the tongue becomes dry and baked, the skin burning and non-perspiring, the respirations hurried, and the nervous system excited, alcohol is doing harm. With regard to its effect on temperature, it is proved only to lower this directly when given in large quantities, and then only to a slight degree. It is in the later stages of fever that alcohol is most useful, and especially in the low forms. No case, however, should be allowed to get into an asthenic condition before stimulants are given, as it may then be very difficult or impossible to restore the patient. If there is any probability of this event taking place, they should be employed from the first. Old people require a great deal as a rule, and young children bear them well. Wine or brandy may be conveniently given beaten up with eggs, or along with beef tea.

The conclusions of Dr. Beale respecting the good effects of alcohol in cases of fever and inflammation may be summed up as follows: 1. By its *direct* action on the nerves of the stomach, it immediately stimulates the heart's action, and thus promotes the capillary circulation. 2. After absorption into the blood, it alters the consistence and chemical properties of fluids and solids, and cuts short the life of rapidly growing bioplasm, or causes it to live more slowly. It reduces the permeating tendency of blood serum; renders the walls of the vessels less permeable to fluids; checks the disintegration of blood corpuscles; interferes with or modifies chemical changes, and has a direct action upon the particles of naked and living bioplasm.

(4.) Attention to *hygienic conditions* is another point of much importance in connection with fever. Free ventilation is very essential, in order to get plenty of fresh air, and to remove that which is vitiated. *Cleanliness* is also to be carefully observed. Rest and quietness of body and mind must be enjoined.

(5.) Many symptoms arise in the course of fever which require special treatment. Those indicating *adynamia* call for free stimulation, the administration of ammonia, ether, camphor, quinine, decoction of bark, mineral acids, &c., and the application of mustard poultices over the heart. Strong coffee and preparations containing phosphorus, are recommended as restoratives. Symptoms connected with the nervous system often give a great deal of trouble. To procure sleep, *opiates* may be necessary, and they are usefully combined with stimulants. Hydrate of chloral is also valuable for this purpose. For delirium, or a tendency to coma, free douching of the head with cold water is often attended with benefit. It may be necessary to shave the head and apply an ice bag; or to apply sinapisms, or a blister to the nape of the neck, or sinapisms to the legs. If nervous symptoms are associated with retention of excretions, means must be taken to promote the removal of these. Symptoms referable to the digestive organs also often demand treatment.

Thirst is best relieved by the frequent sucking of small pieces of ice, which is very grateful to a patient suffering from fever. Vomiting or diarrhœa often require to be checked, by remedies to be mentioned, when considering these symptoms.

(6.) All local complications must be guarded against as far as possible by careful watching, and if they occur, they must be treated accordingly. It is especially requisite to look to the lungs, as hypostatic congestion and inflammation are very apt to arise in connection with these organs. Position will have some influence in preventing this, the patient not being allowed to lie with the head too low, change of posture from time to time being also encouraged. It is further advisable to promote cough and expectoration occasionally, so as to prevent any accumulation of mucus in the bronchial tubes. Bed sores must be prevented by every possible attention, as they are very liable to occur.

(7.) Great care is usually required during convalescence, as regards diet, hygiene, and medicinal treatment. Tonics and remedies for promoting digestion are very beneficial as a rule. Excessive muscular exertion and fatigue must be avoided for some time.

SECTION III.

THE remainder of this work is chiefly devoted to the consideration of individual diseases, and their clinical investigation. It is unnecessary to enter upon any lengthy discussion as to what is meant by "disease." Every abnormal condition of the body or any part of it, either as regards structure or function, is included under this term.

Much controversy has been carried on, and many systems have been proposed, with regard to the NOMENCLATURE and CLASSIFICATION of diseases. The arrangement adopted in the following chapters will be mainly on the model of that recognized by the College of Physicians, most of the diseases being described according as they came under one of the groups mentioned below, though it will be expedient to deviate from this arrangement in some instances.

I. GENERAL DISEASES.—These affect more or less the entire system, and though local morbid conditions are often present, they arise secondarily, as the necessary or accidental consequence of the general disorder. Under this class are included:

(A.) The various *idiopathic fevers* and certain other affections, which are due to the action of a specific poison on the system, introduced from without. *Ex.* Scarlatina, small-pox, ague, &c.

(B.) *Constitutional Diseases.*—These are dependent upon some unhealthy condition of the blood, or *cachexia*, which, however, is usually revealed by local lesions, often occurring in several parts of the body at the same time, or in succession. Many of them are produced by a morbid poison, either entering from without, or more commonly generated within the system, or handed down by hereditary transmission. In some of these diseases no such poison can be detected. *Ex.* Rheumatism, cancer, scurvy, &c.

II. Local Diseases.—Under this group will be described the various affections of the different organs and tissues in succession. It will be convenient to treat under this heading, not only of primary local disorders, but also of some complaints which come under *Division* A of *General Diseases*, as well as of certain local manifestations of *constitutional maladies.*

I. GENERAL DISEASES.

A. IDIOPATHIC FEVERS.

Acute Specific Fevers. Acute Exanthemata.

Before proceeding to consider the individual diseases belonging to this very important class, it is expedient to treat of certain subjects which bear upon them as a whole, and also to indicate the methods to be adopted in their clinical investigation.

CHAPTER I.

ON CONTAGION.

This has appeared to me the most convenient place for entering upon a brief discussion of the main facts and theories associated with this most important question, because, though it has to do with some other maladies, its chief interest is connected with the acute specific fevers. Using the word in its general sense, a "contagious disease" may be defined as "a disease which is capable of being transmitted from one animal to another, either of the same or some other species." The agent by which it is so transmitted is the "contagion."

1. *Origin and Source of Contagion, Conditions under which it Exists, and Modes of Propagation.*—It is needless to discuss what

was the primary origin of the various contagious poisons, and whether they are capable of being produced *de novo* at the present time. Probably a few of the contagious diseases are thus generated, but the majority of these affections with which we have to deal, are communicated from one human being to another, while some are transferred from some other animal to man, *e. g.*, vaccinia, hydrophobia, glanders, malignant pustule, &c. In some cases these can be retransmitted to the same or another animal, usually in a modified form. It has been suggested, that possibly the contagious poison may occasionally be derived from plants.

The contagion exists under different forms, and is given off in different ways. There is one distinct class of affections in which it is associated with obvious parasitic animals or plants, or their germs, *e. g.*, scabies and the various forms of tinea. In other cases it is believed to be connected with organized cells, such as those of tubercle or cancer. Not unfrequently the poison is conveyed by means of pus or other materials, derived from an inflamed or ulcerated surface, or from pustules. Gonorrhœa, syphilis, small-pox, glanders, and puerperal peritonitis afford illustrations of this. It may exist also in the contents of papules or vesicles, and in the substance of the dried scab, which succeeds a pustule, as in the case of small-pox. Many contagious poisons have no palpable existence, but are given off in the various exhalations and excretions of the body, but especially in those coming off from the lungs and skin. Some are supposed to exist in the breath alone, such as whooping-cough; others seem to be present in all the exhalations, as well as in the various secretions, *e. g.*, small-pox. The poison of scarlatina is very abundant in connection with the epithelium, which is shed in this disease. Cholera and typhoid fever are believed to be communicated only through the fæces, which can impart specific characters to any excrement with which they are mixed. Hydrophobia is an instance of a disease only transmissible through a special secretion, viz., the saliva. It has been said that *malignant pustule* may arise from eating the flesh of an animal affected with this disease. The blood may be the channel by which a contagious poison is directly conveyed. It is important to remember also, that the emanations from the body of a person who has died of an infectious disease may produce it in another individual, and this may continue for some time after death.

The next point to consider is, how the contagion may be transmitted from one animal or individual to another, and how it gains access into the system? In some cases it is necessary to bring the substance in which the poison resides, into close and intimate relation with the minute vessels of the tissues, so that immediate absorption may take place. This is artificially effected by *inoculation, i. e.*, by puncturing the skin, or otherwise destroying its superficial portion, and introducing the material into the subcutaneous areolar tissue. It may occur, however, through any abrasion or ulcer, either on the skin or a mucous surface. Hydrophobia, syphilis, and vaccinia, are examples of diseases which can only be produced in this way.

Another mode of communication is by *direct contact*, without any breach of continuity of the surface. This has been specially termed transmission by *contagion*, but it is not advisable thus to limit the use of this word. It is particularly through mucous membranes that poisons may enter in this way, as is well illustrated by gonorrhœa and various forms of purulent ophthalmia. Parasitic diseases are propagated by contact, *e. g.*, scabies, and it is stated that malignant pustule may arise in consequence of the matter soaking through the skin.

A great many contagious affections, however, may be conveyed from one individual to another, without there having been any immediate contact between them. The poison is given off into the surrounding atmosphere, and thus passes to the second individual, by whom it is inhaled or swallowed, or into the pores of whose skin it enters. This constitutes *infection*. It may also get into the food, such as milk, and be thus taken into the system. Further, many poisons become attached to what are termed "fomites," viz., articles of clothing, especially those of a woollen, silken, or cotton fabric, bedding and bedclothes, hair, and various other articles, and are thus propagated. They may retain their activity under these circumstances for long periods, and thus be the means of originating their several diseases after considerable intervals, though they tend to become weakened by time. Persons passing between the sick and healthy often carry a contagious disease to the latter. Contagion may also be conveyed by clothes sent to be washed, or sent home from an infected school, by letters, cabs, and numerous other agencies. The furniture, floor, and walls of rooms also act as "fomites," and may give rise to infection after an indefinite interval, if not properly disinfected.

Flies and other insects are believed to be the means of disseminating contagious diseases in some instances, by alighting first on diseased and then on healthy individuals. Drinking-water is a most dangerous medium for conveying the poison of cholera and typhoid fever, in consequence of the excreta finding their way into it.

Some contagious maladies may be communicated by all the modes just considered, others only through one of them, as will be fully pointed out when treating of these affections individually. The opinion has been expressed that they are all inoculable, if the necessary conditions could be ascertained, but there is no proof of this.

After it has reached a person the contagious poison attaches itself to the skin, as well as to the mucous membrane of the mouth, nose, throat, respiratory passages, alimentary canal, &c., and may even find its way into the air-cells of the lungs. It then passes through the thin membranes, or becomes imbedded in the thick mucous tissue, through which it gradually finds its way, or it penetrates the little chinks between the epithelium cells of the skin. Thus it reaches the minute capillaries and lymphatics, into which it enters, and is then carried through the system. Absorption is promoted by a swollen, soft, and moist state of the skin, or by a weak, distended condition of the capillaries; it is especially facilitated by the presence of wounds or abrasions, and by such a condition as that of the interior of the uterus after delivery (Beale).

2. *Degrees of Contagiousness of different Diseases, and Modifying Influences.*—There are very various degrees with regard to the facility and certainty of transmission of contagious diseases. Some, such as small-pox, are very readily communicated; others, such as typhoid fever, are uncertain. Many modifying influences are also at work. The probability of a contagious disease being

produced is, as a rule, in proportion to the quantity and strength of the poison which reaches the system, but it must be remembered that in many instances a very minute quantity is sufficient. The virulence of a contagion also varies often at different periods in the course of a malady, or of an epidemic. The *mode of application* has considerable influence, inoculation being obviously the most certain. It is believed that a contagion becomes weakened by passing through several persons. If any fluid containing a contagious poison is much diluted, there is less chance of successful inoculation. From some recent experiments, it would appear that by allowing certain liquid materials, which contain contagion particles, to stand for some time, the latter subside to the bottom, so that the upper layer of fluid may be inoculated without producing any effect. By thorough filtration, also, the particles may be separated. Much will depend frequently on the temperament, constitution, state of health, and previous habits of the individual to whom the contagion is applied. A previous attack of a contagious disease usually protects against a second, but not invariably, though when a second attack is observed, it is generally of a mild character. Syphilis cannot be produced by inoculation, after this has been done a certain number of times. It is uncommon for two of these affections to exist in the same person at the same time, and, if such an event occurs, they generally modify one another; in some instances one exercises a protective influence against another, either temporarily or permanently, or modifies it greatly, as is well exemplified in the case of small-pox and cow-pox. Some individuals seem quite insusceptible to certain infectious disorders, without any apparent reason for this. In such cases it has been suggested that the disease has occurred during intra-uterine life.

External conditions have a very important influence. Unfavorable hygienic circumstances undoubtedly increase the virulence of contagious poisons. It is believed that water intensifies the virulence of the contagion of typhoid fever and cholera. Climate and season have a considerable modifying effect, some diseases requiring a high temperature for their development, others being checked by much heat. The *direct application* of great heat or extreme cold, as well as of certain chemical agents, is of the highest importance in destroying contagious poisons, and rendering them inert, as upon this depends in a great measure the power we possess of checking the spread of the diseases produced by them. Among the most active chemical substances are chlorine, hypochlorite of lime, sulphurous acid and sulphites, creasote, carbolic and cresylic acids, Condy's fluid, and chloralum.

3. *Nature of Contagion.*—In the case of those affections which are due to parasites, the particular animal or plant is *the contagion.* With regard to the ordinary infectious diseases, there is much dispute as to the nature of the active principle by which they are propagated. It is pretty well agreed that this is quite distinct from any material with which it may be associated, such as pus, which only forms a vehicle for it, and that in connection with each disease, there is a *specific morbific agent or poison, capable of originating this one and no other, and without the action of which upon the system it cannot possibly occur.* This is named a *contagium, virus, zyme,* or *ferment.* Various theories have been, and still are, held with respect to the nature of this virus, of which the following are the principal. 1. That it is some *subtle entity* which it is impossible to detect. 2. That it is a *chemical substance,* which, as knowledge improves, may be isolated, and which may be solid, liquid, or, as is most commonly supposed, in the form of a *volatile gas.* 3. That it is some "albuminoid matter in a state of rapid chemical change," which gives rise to a fermentative or *zymotic* action in the blood and tissues (hence the name *zyme*). 4. The *germ theory* is that which is most commonly entertained at the present day, which supposes that every contagious disease is due to *living germs,* specifically distinct from all others. As to the precise nature of these germs, however, there is much difference of opinion, and two very distinct theories are held. *a.* It is believed by the majority that they are in reality *microscopic parasites,* which, according to some, belong to the vegetable, according to others to the animal kingdom, such as minute fungi, vibriones, bacteria, &c., or their germs, and of late years bodies of this nature have been described as having been observed in the contents of vesicles or pustules, blood, secretions, excretions, &c., in some of the infectious diseases, such as vaccinia, small-pox, cholera, and typhoid fever. They have been named *micrococci, microzymes,*

microphytes, *microzoaires*, &c. *b.* Dr. Lionel Beale argues that the germs are *not parasitic*, but that they are *extremely minute particles* of *living*, *germinal matter*, or *bioplasm*, which present no differences in appearance in different diseases, even under the highest powers of the microscope, but have an essential difference in *vital power*.*

4. *Effects of the action of the "Contagion" upon the System, and the Changes it undergoes.*—The effects may be entirely local and superficial, as in the case of scabies, and probably gonorrhœa; or they are first local, and subsequently become general or constitutional, *e. g.*, syphilis. As a rule, however, the first action of the morbific principle is on the *general system*, and this is usually followed by local lesions. At present attention will only be directed to this last course of events, as connected more particularly with the specific fevers.

When the poison of a "specific fever" enters the system it is generally believed to produce some primary change in the blood, but some think it acts first on the nervous system. The blood becomes altered soon in its physical and chemical characters, its fibrin being especially diminished. A fermentative or zymotic action is by many supposed to be set up. The germs rapidly multiply, probably at the expense of the albuminous elements in the blood, walls of the vessels, and tissues, and hence the minutest quantity of a contagious poison introduced into the body, may generate an enormous amount of the same. At first there is a *period of incubation*, differing in duration in each disease, but being, as a rule, tolerably definite for each, during which there are either no symptoms at all, or none of any defined character. This incubation period may be very prolonged, as in the case of hydrophobia, which may remain dormant for many months certainly. At the close of this period, in the case of fevers, there are more or less severe *general symptoms*, the onset of which is usually well marked by rigors, &c. They are of a febrile character, but there are frequently some local symptoms besides. The action of the poison on the system may be so intense, and its increase so rapid as to cause death at this time, without the production of any evident structural lesion. If this event does not happen, the local development of the disease becomes manifested after a certain time, which may be limited to one tissue or organ, or be observed in several parts, and this constitutes its *anatomical characters.* The various eruptions met with in contagious fevers are very important local manifestations of these affections. The lesions are indicated by local symptoms, but they often increase the constitutional disturbance also. After a certain period has elapsed, the symptoms subside, and, if fever has existed, *defervescence* occurs according to one of the methods to be presently described. The poison ceases to increase, and is finally expelled altogether out of the system. Permanent structural changes may or may not remain.

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* It is impossible to give more than an outline of this part of the subject, and those who wish for further information are referred to the writings of Burdon-Sanderson, Beale, Simon, Guy, and others.

It is important to observe that in these diseases there is a considerable regularity and uniformity, not only in the *course* of the various stages above described, but also in their *duration*, and therefore in that of the entire affection from first to last, and it is very necessary to be acquainted with this "natural history" of each of these maladies. Complications and sequelæ are, however, very liable to occur, which interfere with the natural progress. Great variety is also observed as regards the intensity of these diseases. In some instances they are very mild; in others they assume a typhoid or malignant type, and are extremely fatal. This difference is sometimes seen running through epidemics.

5. *Elimination of Contagious Poisons.*—As has been already stated, the virus ceases to multiply after a time, and it passes out of the system, this also occurring during the entire course of the case in many instances. It is necessary briefly to consider how this removal is effected. The main theories are—*a.* That the living particles make their own way out of the vessels, and through the tissues, and thus reach the surface. *b.* That they are conveyed outwards, suspended in the fluid which transudes from the small vessels. *c.* That the poison is directly eliminated by the agency of epithelial and secreting cells, especially those of the skin, kidneys, and intestines. According to this idea the cells attract and separate the virus, and are then cast off, being

replaced by new ones. Those who believe in this theory look upon the eruptions, epithelial desquamation, diarrhœa, &c., as *efforts of nature to eliminate the poison*, and on this they found a special treatment, by which they propose to assist nature in this "eliminatory" process. Many, however, are strongly opposed to this view. Beale argues not only that the cells have no eliminatory power, but that the poison actually destroys them, and that this is the cause of the shedding of epithelium which is observed after some of the contagious diseases, such as scarlet fever.

On Epidemics.

Diseases are divided into three classes, according to the manner in which they are disseminated among the population, viz.: 1. *Sporadic*, or those which occur in an isolated and scattered manner, and do not attack large numbers of people at the same time, *e. g.*, bronchitis. 2. *Endemic*, or those which are peculiar to certain districts, or which are constantly prevalent in these districts, to a greater or less extent, *e. g.*, ague, &c. 3. *Epidemic*, or those which suddenly attack large numbers of people, and spread rapidly among them, often producing great devastation; this occurring at irregular intervals, *e. g.*, cholera. These three classes, however, are not absolutely distinct. Sporadic cases of epidemic diseases are common enough, and these are frequently endemic in a district; for instance, typhus fever generally prevails in the filthy quarters of large towns. The terms *zymotic* and *miasmatic* are frequently employed to designate certain diseases, and as there is much ambiguity about their use, it is desirable to indicate exactly what they mean. *Miasmatic* is a term applied to the *specific fevers*. The word *zymotic* implies no theory as to diseases producing fermentation, but now includes all epidemic, endemic, and contagious maladies, which are capable of being prevented, by attention to hygienic and other conditions.

At present attention will be directed to the subject of *epidemics*. They are supposed to be produced by some *epidemic influence*, the nature of which is, in most cases, quite unknown. An epidemic may sometimes be distinctly traced to the influence of contagion, aided by unfavorable hygienic condition, or to some other obvious cause, such as famine, but as a rule its origin cannot be thus definitely fixed; certain diseases occur as epidemics, which probably are not infectious, *e. g.*, influenza. Various theories have been suggested to explain the occurrence of epidemics under these circumstances. The *epidemic influence* or *constitution* has been supposed to reside in the atmosphere around us, and to depend upon the influence of the heavenly bodies; upon gases emitted in connection with volcanoes and earthquakes; upon the electrical condition of the air; upon the quantity of ozone in it; or upon the rapid development and migration of microscopic animalcules. All these, however, are mere hypotheses. When an epidemic of a contagious disease arises, as the result of evident anti-hygienic conditions or otherwise, it is believed either that the specific poison is increased in quantity, or rendered more virulent; or that the constitution of individuals becomes so altered, as to make them more amenable to its influence, and less able to resist it.

The chief facts observed in connection with epidemics may be stated under the following laws: 1. Epidemic influence chiefly affects those diseases which are infectious, making them more prevalent, and more dangerous; or malarial diseases, *i. e.*, those due to a poison originating in the decomposition of vegetable matter. As a rule, only one of these is epidemic at the same time, but sometimes there seems to be a tendency to the prevalence of several of the acute specific diseases together. In some cases other maladies appear to assume an epidemic character, and occasionally an entirely new disease makes its appearance in this way. Sometimes it is only the type of the ordinary diseases that is influenced, or there is a tendency to the implication of special organs. 2. The prevalent epidemic affects more or less the characters of other diseases. This is well illustrated in the case of cholera and influenza, choleraic diarrhœa being very common during the occurrence of the former, catarrhal affections during the existence of the latter. 3. The *extent* of an epidemic varies widely. If this is very great, it usually attacks different places successively, becoming milder in one region, as it invades another. It may be confined to a certain district, being then usually due to some evident cause. 4. The *progress* is also subject to variations. Generally it is regularly onward in a certain direction, and in this way an epidemic may make the circuit of the globe. It may be very rapid, or exceedingly slow and gradual. Sometimes epidemics seem to leave a place, and then return, as if falling back upon themselves; or they pass over special regions, without affecting them; or they go out of their course in a lateral direction, attacking parts not in the line of progress. They are not under the influence of winds, as they frequently advance right against these. 5. The *mode of onset* may be sudden, or more or less gradual, usually the latter. An epidemic also generally gives indications of its approach, by giving rise to some of its symptoms in a mild form, *e. g.*, cholera is generally preceded by diarrhœa; or a few sporadic cases may occur, warning of its approach. 6. The *intensity* of an epidemic is subject to much variety, the disease being in some instances exceedingly fatal, in others comparatively mild. It is greatest as a rule, at the early period, judged by its characters and fatality. This is partly explained by the fact that probably those are first attacked who are most predisposed. The disappearance is generally gradual, the cases becoming less severe and fewer in number, but may be rapid, either from some evident cause, or not. 7. The *duration* of an epidemic is also very irregular. It may persist, with intermissions, for several years, *e. g.*, cholera. 8. *Cycles of epidemics* are frequently observed, one disease after a certain time being followed by another, and this by a third, and so on. Recently a theory has been advanced to explain epidemics, that there is what is termed a *pandemic wave*, under the influence of which a series of *oscillations of febrile diseases* occur, these following each other regularly over the globe. 9. It is most important to notice that epidemics are greatly under human control, both as regards their prevention and making them less severe, by attention to proper hygienic and other measures, to be presently considered. In consequence of the advance of civilization, some epidemic diseases have been entirely eradicated from countries and districts, where formerly they were exceedingly rife; and by well-directed efforts, there is no reason why many others should not be completely expelled. 10. Epidemic influences seem to affect other animals, at the same time as human beings, and it is not at all improbable the same is true with regard to plants.

ON THE HYGIENIC TREATMENT OF CONTAGIOUS FEVERS AND THE PREVENTION AND LIMITATION OF EPIDEMICS.

A most important object to be kept in view, when treating a patient suffering from an infectious fever, is to prevent its extension to others, and the means which promote this end are also useful as regards the well-being of the patient. The measures to be attended to may be thus briefly stated.

1. *Separation* is necessary from other individuals as far as possible, and in some cases almost complete *isolation*. At all events, anything like overcrowding must be avoided, and only those persons who have any business in the room should be admitted. They should wear clothes to which the contagion cannot easily adhere, and go as little as possible into the midst of healthy people. Medical men ought to exercise sufficient precautions against conveying any contagious affection. 2. Adequate *ventilation* is essential, and this is best carried out by opening the windows freely, which should be done even at night, care being taken, of course, to protect the patient from draughts. 3. All excessive curtains, bedclothes, carpets, and other things which may act as "fomites," ought to be removed. In this way also ventilation is promoted. 4. *Cleanliness* must be thoroughly attended to as regards the patient, bed, clothing, rooms, &c. 5. Those who come close to the patient should avoid inhaling his breath or exhalations, and should afterwards not swallow the saliva, but clean out the mouth and nostrils. 6. One of the most important matters to attend to is the *disinfection*, or *complete destruction*, of everything which might convey the contagion. In the first place all *exhalations and discharges* should be *at once disinfected*. Anything coming off from the skin is best destroyed by frequent sponging with some disinfectant. The air of the room should also be somewhat impregnated with some volatile material of this nature, such as chlorine (from chloride of lime), carbolic acid, or sulphurous acid. It is also recommended to place across the doorway a sheet moistened with dilute carbolic acid, Burnett's fluid, Condy's fluid, or chloralum. Secretions from the nose or mouth ought to be removed by disinfected rags, and these immediately burnt. Ex-

cretions *should be received into utensils* containing a disinfectant, and thoroughly mixed with this before being removed from the room. This is especially needful in the case of those diseases which are known to be propagated chiefly by the stools, viz., cholera and typhoid, and, if possible, a separate water-closet should be used for the reception of these, which should be frequently flooded with some disinfecting fluid. The best disinfectants for this purpose are carbolic acid and powder, chloride or sulphate of zinc, cloride of lime or chloralum. All clothing, bedclothes, &c., must be put at once into vessels containing some disinfecting fluid, especially Condy's, or chloride of lime, before being taken out of the room, for the purpose of being washed. The clothes previously worn by a person suffering from a contagious disease ought also to be disinfected. The floor, doors, windows, &c., should also be frequently washed with some material of this nature. 7. Food, such as beef tea, must not be allowed to remain for any length of time in the sick-room, and should never be taken by any one who is not habitually in it. 8. After the patient has left the room it should be thoroughly *cleaned and disinfected* in every corner, and then whitewashed, or repapered and painted. Sulphurous acid, chlorine, or carbolic acid are most useful for disinfecting an unoccupied apartment. *Heat* is very valuable for disinfecting bedding and bedclothes.

It is necessary to carry out these measures more or less thoroughly, in proportion to the degree of contagiousness which the particular disease presents. For example, it is requisite to pay strict attention to them in the case of scarlatina and small-pox.

When an epidemic exists in a district, or threatens to invade it, additional precautions are called for as regards attention to proper hygienic conditions and other matters. Under these circumstances it is requisite to teach ignorant individuals what to do, and to appoint competent persons to visit from house to house, to see that the different measures are properly carried out, especially in low and crowded parts. The chief practical points to be noticed are as follows:

1. *Cleanliness* must be strictly observed in every particular. Frequent washing and white-washing of premises is required. 2.

All overcrowding must be prevented, and free ventilation insisted upon. It is particularly necessary to look to this among the poor, and in common lodging-houses or crowded alleys. 3. Persons who are likely to spread infection must not mingle with others in places of public resort. 4. Special attention must be paid to all *decomposing organic matter*, especially *house refuse*. Everything of this description should, if possible, be at once removed, having been previously disinfected, or if it cannot be got rid of, abundance of disinfecting material must be mixed with it. House drains and sinks, street drains and sewers, water closets, cesspools, privies, ditches, &c., require careful examination, and to be kept in order. The earth in the neighborhood of dwelling-houses is often saturated with organic matters, and demands notice. During the removal of organic matters from houses, it is well, if possible, for the inhabitants to keep away. 5. Disinfectants should be freely employed in and around the houses, and especially where there is much filth. 6. It is most important to look to the source of the *water supply*, especially that which is used for drinking purposes, and to see that no organic matter gets into it from sewers, drains, cesspools, polluted ground, &c. The waste-pipe of cisterns oftens opens into drains, and, owing to an imperfect state of the traps, organic matters find their way into the water. This point must be especially attended to during an epidemic of typhoid fever or cholera. On no account should water be taken which contains any organic matter, and it ought always to be filtered. 7. It may be advisable to remove healthy persons to some place where they would be free from the danger of infection. 8. If there is any known preventive of an epidemic disease, this must be at once resorted to and fully carried out. Thus vaccination should be thoroughly enforced in the case of all who have not been previously vaccinated, during an epidemic of small-pox. 9. It may be requisite to carry out the principle of "quarantine." 10. It is important that the *general health* of the community should be maintained by every means possible, and all causes that can lower the system, such as intemperance or bad living, be avoided. It is particularly necessary for those who attend upon the sick to exercise every precaution. They should live well, but not take too much stimulants. They require daily exercise in the open air, but should avoid fatigue. They also need sufficient sleep, and must pay strict attention to cleanliness. 11. Any person who presents the *slightest symptoms* of the disease which is epidemic, ought to be *without delay* brought under medical treatment. 12. On no account should an individual, suffering from an epidemic disease, be brought into the midst of a healthy locality, if it can possibly be avoided. The conveying of such persons by vehicles used by the public is a wicked crime, and is now punishable by law. Special conveyances are provided, should it be necessary to remove them to a hospital.

CHAPTER II.

ON THE CLINICAL INVESTIGATION OF ACUTE FEBRILE CASES.

A LARGE proportion of the cases which come under observation in ordinary practice belong to the class of *acute febrile diseases*, and it is most essential to have a clear notion how to proceed in their investigation, because it is particularly important that a correct diagnosis should be arrived at in these cases as soon as possible. The special points which require attention are as follows:

1. It is necessary to ascertain whether the patient has been exposed to any infectious disease, or whether there has been any other obvious cause at work likely to give rise to a febrile condition, *e. g.*, malaria, cold, &c.

2. If possible, the *exact date*, *even the hour*, of the onset of symptoms must be fixed, and the *mode of invasion* determined.

3. The *symptoms* which have occurred in the course of the case are then to be inquired about, as well as the times at which they appeared, and likewise those which exist at the time of observation. During the *premonitory, or early stage* of the acute specific fevers, certain *local symptoms* are usually present, differing in each, and more or less characteristic. Those which require to be particularly investigated are,—the severity of general pains; the existence of any localized pain, especially *in the back* or *epigastrium;* catarrhal, throat, stomach, intestinal, and head symptoms. Of course, if the pyrexia is due to inflammation of some organ or tissue, there will probably be local symptoms, indicating the seat of the mischief.

4. It is of the greatest importance to determine the *degree of pyrexia*, as well as its *course* and *mode of progress*. This is done by the careful and systematic employment of the thermometer. In this way, even at a very early period, much assistance is arrived at in coming to a diagnosis In the *exanthemata*, the fever is of the "continued" type. By its degree of intensity, and rapidity of onset, the nature of the exanthem may, in many cases, be foretold at a very early stage. Each is supposed to have a definite course of temperature, and on the whole this is true; but a good many exceptions are met with.

5. Most of the *acute specific diseases* are attended with a skin *eruption*. This constitutes one of the chief *anatomical characters* of any special fever, and generally enables us at once to distinguish it from all others. It must be remembered, however, that this is not always present, for there is no doubt but that scarlatina, measles, small-pox, &c., may occur without any eruption. When due to inoculation, it may be confined to the spot where the morbid material is introduced, *e. g.*, vaccinia. The points to be observed with regard to any eruption are—*a*, the *exact time* of its appearance; *b*, its *primary seat*, and the mode and rapidity of its extension over the body should this happen; *c*, its *amount*; *d*, its *precise characters*, and the *changes* it undergoes during its progress and decline; *e*, its *duration* and *sequelæ*.

6. In all febrile cases, it is imperative to make a careful *physical examination* of all the chief organs of the body, and under this is included *examination of the urine*. This may reveal the cause of the pyrexia, even where there are no symptoms pointing to any particular organ. Besides, it must be borne in mind, that, even in the specific fevers, complications are very prone to arise, or some of the organs are primarily affected; and it is most important to detect any derangement in connection with these as soon as possible. Hence *daily examination* at least should be carried out, and in many cases it is requisite to examine the principal organs even more frequently. The *sphygmograph* is of value, as indicating the condition of the circulation.

ON THE USE OF THE THERMOMETER.

The value of the *thermometer* in the investigation of disease is now so generally recognized in theory, that it is unnecessary to enter into any discussion on this subject; at the same time it is desirable to impress upon all the extreme importance of employing this instrument in *daily practice*, because there can be no doubt that even now many do not use it to the extent which it deserves.

Neither is it requisite to give any detailed description of the instrument to be made use of. All that need be said, is, that this should be *sensitive and accurate*, of a sufficient range, *self-registering*, and of a convenient size to be carried in the pocket. These conditions are fulfilled in the clinical thermometers which are sold in most respectable instrument shops.

Mode of Use.—Before applying the thermometer, it should be warmed, by holding the bulb in the hand, or in some other way, until the top of the *registering index* reaches about 98°, but care must be taken that it is not above this. The regions usually employed for taking the temperature are the axilla, the inner side of the upper part of the thigh, the mouth, rectum, or vagina. Sometimes it is requisite to notice *local temperatures.* It is necessary that the instrument should be in close contact with the surface, and completely covered. When the temperature is taken in the axilla, which is the best place on the whole, the patient should lie on the same side, and press the arm firmly to the side; or it may be necessary to strap it to the surface. The mouth does not give accurate results, but it may conveniently be made use of to give approximate information, the thermometer being placed under the tongue, and the mouth firmly closed. With regard to the time required for the instrument to be retained in its position, there is a difference of opinion among observers. With proper precautions, *five minutes* is usually sufficient, especially if "two observations at intervals of one or two minutes give exactly the same result" (Aitken). To be strictly accurate, however, many think that the mercury ought to *remain stationary for five minutes.* Baumler gives—for the rectum three to six minutes; mouth, nine to eleven minutes; axilla, eleven to twenty-four minutes, in order to be scientifically correct.

It is desirable, if possible, that the individual upon whom the observation is made should have been at rest in bed at least an hour previously.

The intervals at which the observations should be made will vary according to the nature of the case. Often only one is required. In most instances twice a day is sufficient, viz., in the morning and evening, and in many once daily is enough. Sometimes, however, it is most important to note the temperature at very frequent intervals, or even to allow the thermometer to remain constantly applied. Should this be needful, it is advisable to teach the nurse, or some other intelligent person, how to use the instrument, and they might also employ it if any unusual symptoms should arise. In all cases of fever it is requisite to have recourse to the thermometer until convalescence has been firmly established, for reasons to be presently indicated.

In using the thermometer, the points to observe are—1st, the degree of the temperature, as indicated by the *end of the index most distant from the bulb*, 2dly, the rapidity with which the mercury rises, this being in proportion to the height of the temperature. It is important to take a note at the same time of the *frequency of the pulse and respirations*, and, in some cases, it is desirable to make a *quantitative analysis* of the urine, in order to determine whether there is a relation between the temperature and the amount of urea, uric acid, &c., discharged. All these observations should be recorded on proper forms, of which several have been planned, the temperature being indicated by angular lines or curves.

Temperature in Health, and chief Modifying Influences.—In the axilla, the temperature in health averages about 98.4° F. According to circumstances, however, it may vary from 97.3° to 99.5°, or even 100°, but if it goes beyond this range in either direction, and remains persistently above or below the normal, there is something wrong. The chief circumstances which influence the temperature in health are as follows: 1. *The part of the body* in which it is taken. It is higher in internal parts, such as the rectum or back of the mouth, than in external parts; in sheltered regions of the body than those which are exposed; in the trunk than over the limbs. 2. *Age.* The temperature, according to most observers, is higher in children and young persons than in adults. It also is said to rise in old age. 3. *Time of the day.* During the day the temperature gradually rises until evening, and then falls slowly until early morning, when it again ascends. In this way there is a variation of about 1.5° during the twenty-four hours in adults, but the range is greater in children. 4. *Climate, and Exposure to Heat or Cold.* In the tropics the average temperature is a little higher than in temperate or cold climates, and it may reach 99.5°, or even 100° F. Long exposure to great heat or cold will also influence it. 5. *Food and Drink.* After a full meal the temperature at first falls, but it increases as digestion goes on. *Fasting* lowers the temperature. Alcohol seems to cause a speedy fall, but it is only temporary, and it requires a considerable quantity to influence the temperature materially. Certain articles in daily use produce some effect, such as tea and coffee. 6. *Exercise* increases the temperature especially that of the extremities, provided it is not sufficient to produce great fatigue. 7. Prolonged study and other forms of mental effort cause a slight depression. 8. Mr. A. B. Garrod has found that the temperature rises on stripping off the clothes and exposing the surface of the body, and the difference is greater in proportion to the coldness of the surrounding air. When the temperature of the air is above 70° F., there is a slight fall, but a rise to the previous temperature soon takes place.

The *chief source* of the animal heat is usually considered to be the chemical changes in the food and tissues, which are constantly going on in the body, the heat thus produced being diminished by evaporation from the surface, while the circulating blood causes the temperature to be uniform throughout. Dr. Beale believes that the *conversion of non-living into living material* is the cause of the production of heat.

The Use of the Thermometer in Disease.—In the great majority of cases, the deviation from the normal as regards temperature which occurs in disease, is in the direction of excess, there being in short "pyrexia." By the aid of the thermometer, we are able accurately to determine the amount of this increase; and it is for this purpose that the instrument is chiefly employed. Occasionally the animal heat is below the normal, and it may be unequal in different parts of the body, but these deviations are not often of much consequence. It may be mentioned here that Fahrenheit's scale is used throughout this work.

In this place it is only intended to sum up concisely the circumstances under which the thermometer is valuable. When treating of individual diseases it will be pointed out in connection with which of them the temperature presents any peculiar characters as to degree or range.

The information given by the thermometer may be available for indicating 1. Diagnosis; 2. Prognosis; 3. Treatment.

1. Much help is constantly derived from the thermometer as regards *diagnosis*, and the following remarks may serve to gather up the circumstances under which it is thus useful. *a.* In many cases which present themselves in ordinary practice, where symptoms exist which might or might not belong to the premonitory stage of some acute illness, taking the temperature often at once clears up all doubt. Thus we have frequently found in the out-patient room, the symptoms of scarlatina or small-pox were complained of; by the help of the thermometer we have been enabled to negative the supposition of either of these diseases existing, or, on the other hand, to corroborate such an opinion. In short, the instrument enables us at once to determine whether pyrexia is present or not, as well as its degree, and is thus a most valuable guide to the physician. *b.* Occasionally by one, or at most two *observations*, it is possible to ascertain positively the *nature of a fever*. For instance, if the temperature suddenly rises to 104° or 106° F., the patient having been quite well on the previous day, he is probably suffering from some form of malarial fever, and this is certain if the temperature falls rapidly, so that it becomes normal in a few hours. Such a case, presenting some difficulty in diagnosis at first, came under my notice at University Hospital a short time since. *c.* Many febrile disorders are now known to have tolerably regular and uniform ranges of temperature throughout their entire course, and to present peculiar diurnal and nocturnal variations, being, as in health, generally higher by night than by day. It is, therefore, essential to become acquainted with this portion of the *natural history* of each of these affections, and to employ the thermometer regularly in investigating them, so that they may be distinguished from each other, and from all complaints which may simulate them. *d.* The habitual use of the thermometer may indicate disease, when there is no other evident sign of its existence, and may thus lead to more minute examination, ending in a complete diagnosis. This has been frequently

observed by those who employ the thermometer in lunatic asylums, who have thus detected phthisis in insane patients, when they would not otherwise have suspected it. *e.* Complications occurring during the progress of fevers. or during the period of convalescence, as well as relapses, are indicated by a disturbance of the typical range, by a delayed defervescence, or by an increase in temperature after it has once subsided; and this may be the first thing observed. Hence the necessity of taking a daily note of the temperature until the patient has quite recovered. *f.* In certain diseases the thermometer gives information as to whether a morbid process is actively progressing or not, *e. g.*, in tubercular affections. Further, it may serve to distinguish between different forms of a particular affection; thus *pulmonary phthisis* may be the result of different pathological conditions, and it is probable that they are characterized by distinct types of temperature. Also, when hæmoptysis has occurred, the thermometer is useful in indicating whether any blood which remains in the bronchial tubes has given rise to inflammation, this being attended with a rise of temperature. The same is true of an apoplectic clot in the brain. *g.* Inequality cf temperature is sometimes of aid in diagnosing paralysis or other nervous disturbance.

2. The temperature may be of use is assisting towards a *prognosis*, either in itself, or from its relation to the pulse, respirations, or amount of excreta, or its association with other symptoms. *a.* The *degree of heat* observed during the early period of a febrile disease, especially when taken in conjunction with the symptoms present, will often give a good idea as to whether the case is likely to be a severe one or not. If it is at all high, it shows that a sharp attack may be anticipated, and that complications resulting from the presence of products of decomposition in the blood are liable to arise, therefore a guarded prognosis should be given. *b.* A very high temperature, especially when it exhibits a tendency to a rapid rise, is highly dangerous, especially if the excretions are deficient. Very rarely has a case recovered after the temperature has reached 107° F. *c.* A sudden change in the temperature may indicate something that is going to happen, for some days before it actually occurs. Thus a marked fall in typhoid fever not uncommonly precedes hemorrhage from the bowels, and gives warning of its approach. *d.* If the temperature does not increase, or falls from morning to evening, it is a favorable sign; if it is higher in the morning than on the previous evening, this shows that the disease is increasing, and the prognosis is consequently more grave. *e.* In many pyrexial diseases the fever usually subsides on certain days, often by crisis; if in such cases the expected fall takes place, and defervescence goes on regularly and continuously, the prognosis is favorable; if the contrary, or if the decline of the fever is irregular, an unfavorable course is indicated. *f.* Should the temperature decline rapidly in certain acute febrile affections, such as pneumonia or typhus fever,

while the pulse and respirations increase in frequency, and the other symptoms show no signs of improvement, but on the contrary get worse, the prognosis is very serious. A very low temperature is in itself an evil omen.

It must be remembered that accidental circumstances may temporarily modify the temperature in disease as in health, such as food, exercise, excitement, &c. It may be increased by sources of irritation, *e. g.*, by retained urine or fæces, and on the removal of these it may be considerably reduced. Defervescence may proceed so far that the animal heat is brought below the normal, sometimes considerably. After convalescence from severe continued fevers the temperature is often low for some time. The same thing is also observed during the apyrexial periods of intermittent fever, and in the remissions of the remittent variety.

3. The value of the thermometer as indicating *treatment* may be gathered from the remarks already made, and it will be only necessary to give two or three illustrations. A *very high and ascending temperature* calls for prompt recourse to the use of cold, as already described under the treatment of pyrexia. In ague, after this disease has apparently subsided, it is found that the temperature still rises at the usual intervals, and until this has become quite normal for two or three days, treatment must not be discontinued. During convalescence from fevers an increase of heat may be due to something wrong in the diet, or in the use of medicines, and it should lead to careful inquiry on all matters by which it might be produced, so that appropriate measures may be adopted.

CHAPTER III.

CONTINUED FEVERS.

SIMPLE CONTINUED FEVER—FEBRICULA.

A CONSIDERABLE number of cases come under observation, which present the ordinary symptoms of "fever," without our being able to refer them to any of the contagious fevers, or to trace the symptoms to any sufficient local cause. Besides these, there are not uncommonly "anomalous forms," to which various names have been applied. Though many of these cases scarcely come under the class of acute specific fevers, they may conveniently be described here.

Etiology.—Simple febricula does not seem to be contagious, or to depend upon any specific poison as a rule. It may result from cold, or excessive heat, such as long exposure to the sun, overeating or drinking, or great fatigue. Often no distinct cause can be made out. Probably some of the cases are due to the action of one of the contagious poisons, modified by the constitutional condition of the individual, or by the quantity being very small. I have known an epidemic of typhoid fever to be preceded by cases of febricula.

Symptoms.—Febricula is characterized by the ordinary signs of "fever" in their most typical and simple form, but of variable intensity. The *invasion* is either by chilliness or slight rigors, with general pains, lassitude, and headache. After this the skin becomes hot and dry, and the pulse frequent and full. Severe headache is often complained of, and the face is flushed, while the patient is restless, and sometimes delirious at night. There is thirst, furred tongue, loss of appetite, and constipation. The urine is febrile. Frequently symptoms are present, indicating the existence of catarrh of the mucous membranes, but these are not sufficient to account for the pyrexia. Roseolar or erythematous eruptions have been described as occurring in some instances, and also certain bluish spots.

The rise in temperature is rapid, and it may reach 102°, 103°, or even 104°, in a few hours. This high temperature, however, only lasts a short time, as a rule, often but a few hours, or one or two days, and then sinks rapidly.

Duration and Termination.—The duration is generally about 3 or 4 days, but a case may last a week or 10 days before convalescence is complete. Defervescence is usually by *crisis*, the temperature falling to the normal in from 24 to 36 hours, and there being a copious discharge of urine, with abundant deposit of lithates, free perspiration, and sometimes diarrhœa, or epistaxis. Occasionally defervescence is *by lysis*, and convalescence is consequently delayed. The termination is always in recovery.

Diagnosis.—The chief point to attend to is not to give too hasty an opinion as to the nature of a case presenting merely febrile symptoms. The *rapid increase* in temperature is an im-

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portant sign of simple febricula, especially as distinguishing it from typhoid fever.

TREATMENT.—All that is required is to keep the patient in bed, give a slop diet, with cooling drinks, open the bowels freely, and administer some saline mixture. If there is much heat of skin, tepid sponging is very useful. After the pyrexia has subsided some quinine may be given.

TYPHUS FEVER.

ETIOLOGY.—Typhus fever is produced by a *specific poison*, and is contagious. This poison is principally given off in the exhalations from the skin and lungs, being afterwards inhaled or swallowed. These exhalations have a peculiar odor. Infection is far more likely to happen in the case of those who are brought into close and frequent contact with the sick, and hence nurses and medical men are commonly attacked. It must be borne in mind, however, that in some instances, especially if there are a number of cases together, and the poison is therefore concentrated, a very short, even, a momentary exposure may produce typhus fever. The contagious influence does not seem to spread to any great distance, and is much diminished by dilution with air. In well-ventilated private houses the disease rarely spreads, and it never extends from hospitals to adjacent streets. It is more likely to pass from a low story to a higher, than in the contrary direction. Fomites become infected, such as clothing, bedding, furniture, or the walls of rooms, and may retain the contagion for some time, if not exposed to the air, being the means of originating the disease, and even conveying it some distance. Woollen and dark-colored materials are said to take up the poison most readily. Typhus fever is said to be most contagious during convalescence, but the infection probably exists from the end of the first week, until convalescence is complete. A second attack is an exceedingly rare event.

The opinion is strongly held by some eminent observers, that typhus fever may be produced *de novo*, and not as the result of infection, in consequence of great overcrowding and destitution.

Predisposing Causes.—There are certain circumstances which greatly intensify the action of the typhus contagion, and render individuals more liable to be attacked. These are: 1. A low physical condition, produced by intemperance and bad feeding, or chronic disease. 2. Overcrowding and deficient ventilation, especially overcrowding of dwelling-houses, or of individuals in the same house or room, with bad ventilation. 3. Want of cleanliness, domestic and personal. 4. Mental depression, from overwork or anxiety, or fear of contagion. 5. A temperature *not too high*. In consequence of the action of these causes, we find this fever infinitely most prevalent amongst the poor, in the crowded parts of large towns, especially in those places where the sanitary arrangements are inefficient, in low regions, in crowded camps or dwelling-houses, such as low lodgings, and in cold and temperate climates. Epidemics are also very apt to occur during periods of distress and famine from any cause. Great Britain and Ireland seem to be the chief seats of typhus, and it is stated not to occur within the tropics. Mental causes appear to act most in connection with persons belonging to the better grades of society. Something may probably be attributed to *individual susceptibility*, some persons being more prone to be attacked than others.

ANATOMICAL CHARACTERS.—The *blood* is much altered in typhus fever. It either remains fluid, or forms very soft clots, and tends to decompose rapidly. The fibrin is diminished, and the red corpuscles, which are increased in number at first, afterwards become deficient. The salts are in excess, and urea and ammonia are present, the latter being supposed to be produced by the decomposition of the former. Under the microscope the red disks are seen to be irregular in form, and crenated, and they collect in amorphous heaps. The coloring matter transudes, and tinges more or less the tissues and the fluid in serous cavities.

The body does not usually present much emaciation, but decomposes rapidly. The maculæ on the skin (to be presently described) are frequently visible after death.

The voluntary muscles are of a dark color, and softened. Their fibres often exhibit signs of degeneration under the microscope. Sometimes hemorrhages take place into them. Similar softening, with fatty degeneration, is observed to a marked degree in the heart. It is believed also that the same change occurs in connection with the involuntary muscular tissue generally.

There is nothing characteristic in the brain. There may be some congestion and excess of serum, and occasionally slight arachnoid hemorrhage has been observed. In some epidemics, forms of meningitis have been described, involving also the membranes surrounding the cord.

All the organs are commonly hyperæmic, softened, friable, and enlarged, especially the liver and spleen; the latter may be quite pulpy, but does not reach a very great size. The salivary glands are frequently inflamed, and may be the seat of suppuration or gangrene. Acute nephritis is sometimes observed.

In the alimentary canal the appearances met with are, occasional redness and softening of the gastric mucous membrane, congestion or inflammation of that lining the intestines, especially the colon, and enlargement of the glands, which is particularly noticed in children. There is never any deposit or ulceration such as are present in typhoid fever.

There may be various lesions of the nature of complications. Bronchitis is very commonly observed, as well as hypostatic congestion of the lungs, which may end in hypostatic pneumonia. Sometimes ordinary acute pneumonia exists.

SYMPTOMS. I. *Incubation Stage.*—The *period of incubation* is said to average about nine days. During this time there may be some symptoms, such as chilliness, general pains and malaise, restlessness, headache, and loss of appetite, but these may be entirely absent.

II. *Actual Attack.* 1. *Invasion Stage.*—The invasion may be singularly sudden, as I know from personal experience, but generally it is somewhat gradual. It begins either with a series of slight or moderate rigors, or with one severe and prolonged fit of shivering, followed by pyrexial symptoms. The rigors often recur for two or three days. There is a marked sense of depression and exhaustion, the patient speedly taking to his bed, and presenting an aspect of weariness and heaviness, or appearing to be quite prostrated. General muscular pains are complained of, and the limbs tremble on movement. Nervous symptoms are prominent. These are dull frontal headache, often severe, with a feeling of heaviness in the head, and throbbing; giddiness, deafness, and noises in the ears; flashes of light, and photophobia; sometimes an unpleasant smell; restlessness, and disturbed unrefreshing sleep, though the patient is often very drowsy. The mind soon begins to wander, and becomes confused as to time, place, and surrounding circumstances and individuals, distinct delirium setting in from the fourth to the eighth day, which is not constant at first, and the patient may be roused to answer a question. It is most frequently of a dull and muttering character, but may be extremely active and excited at first, the patient being sometimes very violent. The expression is heavy and indifferent, the eyes are injected and suffused, and a more or less dusky flush covers the cheeks, the complexion having a dingy and dirty appearance.

Nausea and vomiting are sometimes present, and may be distressing symptoms. The tongue is at first covered with a thick, white fur, but soon tends to become dry and brown. It is often tremulous. There is much thirst, and total anorexia, with a disagreeable, slimy taste in the mouth. The bowels are generally confined, but some diarrhœa is often present; the stools, however, presenting no peculiar characters, and being usually dark. The spleen can often be detected to be enlarged.

The skin is hot and pungent, but the range of temperature will be separately considered. The pulse becomes frequent, rising steadily to 100 or more, and being often large and full, but very compressible. It may be small and weak, or dicrotic. The urine is markedly febrile.

Commonly more or less catarrh of the nasal and respiratory mucous membranes exists, with cough and expectoration, and some dry râles may be heard over the chest.

2. *Eruptive Stage.*—Two forms of eruption occur in typhus fever, viz.: 1st, *a subcuticular mottling;* and 2dly, *distinct maculæ or mulberry spots.* Usually, both are observed in variable proportions, but the mottling is not unfrequently present without the spots, though the latter very rarely exist without the former. Children often do not exhibit any rash, and in them the mottling is most marked. The eruption usually appears on the 4th or 5th day, but may come out at any time from the 3d to the 7th

or 8th day. The back of the wrists, borders of the axilla, and epigastrium, exhibit it first; it is not limited, however, to any particular part, but spreads rapidly over the trunk and limbs, though only rarely seen on the face and neck. *The rash is all out within one, two, or three days, and no fresh spots are developed after this, while each spot is perceptible until the entire rash disappears.* The *amount* varies considerably, but the maculæ are frequently very numerous, and may cover the skin almost completely.

Characters and Course. a. *Maculæ or Mulberry Rash.*—A number of distinct spots are first observed, varying in size from mere points to two or three lines in diameter, the larger being formed by the union of smaller ones. They are irregularly roundish, the larger spots being the more irregular; their margin is ill-defined. They are quite superficial, and, at first, are often slightly raised; but this elevation subsides in a day or two. The *color* is described as resembling the stains of mulberry-juice, being, as a rule, at the outset of a brightish or pinkish-red. It is deeper at the centre than at the margin, and completely disappears under pressure, returning again when the pressure is removed. In a few days the hue deepens, and may become purple or dark crimson or livid, especially towards the centre of the spots, which, at the same time, become more defined at their margin. This is especially observed over the back and other dependent parts. Pressure only *diminishes* the color after three or four days, a light yellow stain being left, and finally *it does not affect it at all*, the spots being, in fact, converted into true petechiæ, of a uniform hue. The eruption, looked at as a whole, has not an equal depth of color.

b. *Subcuticular Mottling.*—This is most marked in dependent parts, and is described by Dr. George Buchanan as "a faint, irregular, dusky-red, fine mottling, as if below the surface of the skin some little distance, and seen through a semi-opaque medium."

The *duration* of the rash varies. It usually subsides from the 14th to the 21st day. The *mottling* disappears more readily and sooner than the *spots*, and the latter remain longer if they become petechial. No desquamation follows the disappearance of the eruption.

The skin of dependent parts is more or less congested, especially that of the back.

Miliary vesicles or sudamina may appear about the end of the second week, usually in the groins, subclavicular regions, or over the epigastrium.

A peculiar odor is given off from the skin of persons suffering from typhus. During the eruptive period, most of the symptoms previously existing become worse, and tend to be of a low, adynamic character. The headache, however, usually subsides on or before the 10th day, and, if it should continue along with marked delirium, it is a sign of danger, indicating some brain complication. Debility and prostration become very great, the patient lying on his back, helpless, with the eyes closed, or half-closed, in a state of muttering delirium, from which it is difficult or impossible to rouse him. Somnolence often sets in, which may be followed by complete stupor and coma. Muscular twitching and trembling, rigidity, or picking at the bedclothes, are frequently observed, and occasionally convulsions, with strabismus. Sometimes coma-vigil is present, the patient lying with the eyes wide open, apparently awake, but staring vacantly into space. The complexion becomes muddy-looking, and a more dusky flush covers the face, which may be almost livid. The conjunctivæ are extremely injected and suffused, the pupils being often contracted. The skin of the extremities becomes cold and perspiring. The tongue is dry, brown, and cracked, often covered with a thick, blackish crust, and immovable; its surface is red, and tends to bleed; sordes cover the lips and teeth. Patients drink with avidity, but swallowing is difficult. The nostrils are stuffed up. Tympanitis sometimes occur. The pulse rises to 120, 140, 150, or more, but remains stationary after reaching a certain point; it is small and weak, and may be irregular. The heart's impulse and sounds are feeble, especially the systolic sound, and capillary stasis is very prone to occur. Respiration is much hurried and disturbed, and frequently abdominal. The breath has a most peculiar and unpleasant odor. Physical examination shows the existence of numerous râles in the lungs, or may indicate the presence of complications. Incessant hiccough sometimes exists.

The urine not uncommonly is albuminous, or contains a little sugar; it may be retained, or passed involuntarily along with the stools. Bed-sores are very liable to be produced over parts that are pressed upon.

The severity of the symptoms varies in different cases, but if the case goes on to a fatal issue, prostration becomes more and more complete, the heart's force is exhausted, and the nervous symptoms indicate that the nerve-centres are still more disturbed. Before death the temperature may rise or fall rapidly, and, in some cases, the pulse suddenly falls. Complications may occur to hasten a fatal result.

3. *Stage of Defervescence.*—This sets in, in cases of recovery, from the 13th to the 17th day, generally at the end of the second week. There is a remarkable and sudden *crisis*, which often occurs by night, the patient falling into a deep sleep, lasting for many hours, on awaking from which a wonderful improvement is observed in the aspect of the patient, and in the symptoms. The temperature falls considerably, and also the pulse, which gains in strength. The skin is soft and perspiring, the eruption less marked, and the complexion clearer. The tongue becomes moist, and cleans from the edges, either in patches or molecularly, and there may be some inclination for food. Delirium has ceased, the patient recognizes those around, but the mind is still confused, and entirely unconscious of all recent events. There is a feeling of extreme weakness, and the limbs seem as if they did not belong to the body. Unless complications or sequelæ occur, convalescence begins at once, and the strength is regained comparatively rapidly, but it is some time before this is completely restored. The tongue soon cleans, and the appetite becomes perfectly ravenous; it is only those who have experienced it who can realize the extreme sense of hunger which is felt. Much sleep is indulged in, and the mind does not regain its normal vigor for some time. A *relapse* of typhus is *extremely rare.*

Temperature.—Different observers have described different ranges of temperature in typhus fever, and this appears to depend partly upon the nature of the epidemic. The *ascent* is steady and continuous up to the 4th or 5th evening, without any morning remission. The maximum temperature is rarely under 104.9° to 105° F., often 107°, or even above this; and it may reach 106° F. on the 3d or 4th evening in severe cases. In slighter cases it may not be above 103.5° F. A slight morning remission occurs on the 6th morning, and a well-marked fall on the 7th day, unless the case is very severe. After this a rise takes place again, but rarely to the maximum. In fatal cases, however, it may go up to 108° or 109° F. The temperature is *continuous* up to the *period of defervescence*, with a distinct, but not considerable morning remission. This is more marked in cases where the temperature is high, and may average from $\frac{6}{10}$° to $1\frac{1}{2}$°. Dr. Buchanan states that it ranges from 1° to $1\frac{1}{8}$°, until the middle of the 2d week, and afterwards $1\frac{1}{2}$°.

Defervescence is very rapid and sudden, occurring from the 13th to the 17th day, and the temperature may fall to or below the normal in 12, 24, or 48 hours. It is often preceded by a rise above the previous day. Occasionally after the sudden fall, there is a rise of 2° or 3°, and then defervescence extends over some days. In short, there is a combination of *crisis* and *lysis*.

As already mentioned, in fatal cases there is frequently a rapid elevation or sinking of temperature, and it may reach 109° F. on the one hand, or 95° on the other.

Some observers have found a relation between the temperature and pulse, but this is by no means constant or uniform, and the one may be high, while the other is low.

VARIETIES.—Cases of typhus fever present considerable differences as regards their intensity, and the prominent symptoms observed, to which special names have been applied. The *nervous system*, *circulatory*, or *respiratory organs* may appear to be most affected. In some epidemics there has been a great tendency to gangrene, hence named "putrid fever." Typhus fever may kill in a few days, by the *direct action* of its poison upon the system, before any local lesions are produced.

Niemeyer describes cases in which the earlier symptoms of typhus occurred, without any eruption or enlargement of the spleen, and in which convalescence set in at the end of a week.

COMPLICATIONS AND SEQUELÆ.—These can only be enumerated, but it must be mentioned that they should always be looked for and guarded against, as they may arise without any evident symptoms. 1. *Affections of the respiratory organs*, viz., *bronchitis; pulmonary hypostatic congestion and consolidation;* pneumonia; gangrene of the lung (very rare); pleurisy; phthisis; laryngitis, with œdema glottidis. 2. *Affections of the circulatory organs and blood. Cardiac softening;* phlegmasia dolens; scurvy. 3. Partial paralysis, as a sequela, which is usually soon recovered from. 4. Dysentery in some epidemics. 5. Gangrene of the toes, nose, &c., especially during the winter; or cancrum oris in children. 6. Erysipelatous affections of the skin, throat, or deep tissues with suppuration. 7. Suppurative inflammation or "buboes" of the parotid or submaxillary glands, beginning in the cellular tissue around. 8. Inflammatory swellings and abscesses in various parts of the body. 9. Suppuration of joints. 10. Renal disease.

DIAGNOSIS.—In the early stage of typhus fever there is often much doubt. The important symptoms are rigors, followed by fever, headache, debility, and prostration, general pains and aching, furred tongue, with loss of appetite and thirst. Exposure to infection will aid the diagnosis. The temperature is of great use in arriving at a conclusion. The eruption clears away any doubt which may exist.

In this country the diseases with which typhus might be confounded are: 1. Typhoid fever. 2. Measles. 3. Relapsing fever. 4. Asthenic pneumonia. 5. Inflammation of the brain or its membranes. 6. Delirium tremens. 7. Various blood poisonings, viz., uræmia from kidney disease, pyæmia, glanders, jaundice, and erysipelas. The distinguishing characters between it and some of these affections, will be again pointed out.

TERMINATIONS AND DURATION.—Most of the cases of typhus fever end in recovery. The mortality varies in different epidemics, but the average number of deaths is stated to be about 1 in 5. The average duration is about 14 days, but it may extend to 21 days; if beyond this, it is due to complications. On the other hand, a case may run a much shorter course. Death may take place from coma, the result of blood-poisoning or high temperature; from syncope; or, usually, from both causes; or it may be due to complications.

Prognosis.—This is always grave, and a very guarded opinion should be given. The chief general circumstances which increase the danger of any particular case are as follows: 1. The patient being of middle or advanced age. 2. The male sex, to some degree. 3. A low condition of the system, either constitutional, or due to privation or fatigue, intemperate habits, previous diseases, &c. A gouty constitution is most dangerous. 4. Mental depression, and a presentiment of death on the part of the patient. 5. Improper hygienic conditions, especially bad ventilation and overcrowding. 6. Neglect of proper treatment until a late period.

The symptoms and complications present afford most important indications as regards prognosis. Those of unfavorable import are: 1. Extreme prostration, with a dry, hard, brown tongue, marked tympanitis, or persistent hiccough. 2. Great feebleness of the heart's action, as shown by the impulse, sounds, and pulse; or a very excited action, with weak pulse; or a very frequent pulse, which is extremely weak, irregular, or intermittent. 3. Severe and early cerebral, and other nervous symptoms, especially continued sleeplessness with delirium, deep coma, or *coma-vigil*, muscular tremors, twitchings or rigidity, carphology, subsultus tendinum, *convulsions*, early relaxation of the sphincters, strabismus, and *great contraction of the pupil.* 4. A very high temperature, without any remission on the 7th day, especially if it persists, and shows a tendency to rise; or a *sudden fall*, the other symptoms not improving. 5. A large amount and dark color of the eruption, especially if with numerous petechiæ, and if there is lividity of the face and limbs, with deep congestion in dependent parts. 6. Suppression or retention of urine, deficient elimination of solids, the presence of much albumen or blood, especially with casts, and particularly the early occurrence of these symptoms. 7. Signs of collapse. 8. Pulmonary complications, gangrene, erysipelas, &c.

Treatment.—The principles already laid down with regard to the treatment of *fever* in general, are those which should chiefly guide us in the management of cases of typhus. There is no possibility of stopping its course, and we have only to assist nature in bringing the disease to a satisfactory termination.

It is most important to attend strictly to all the hygienic conditions, which have before been referred to, in connection with contagious fevers in general; and also to look after every point connected with the sick-room, as well as to see that *proper nursing* is obtained. These matters are often of greater moment than any medicinal treatment, and always aid considerably in conducting a case to a successful issue.

It may be laid down as an invariable rule of practice, that patients suffering from typhus *will not bear any kind of lowering treatment*, but that they always need to be supported more or less, and their strength must be husbanded in every possible way. They should take to bed *at once*, and use no exertion whatever, on no account being permitted to get up to stool, but a bed-pan being employed. From the first, a nutritious and easily assimilable *diet* must be administered, chiefly consisting of liquids, and these must be given according to the rules laid down, when speaking of *fever*. It is essential to give them at regular intervals, and *not to neglect them by night.*

Alcoholic stimulants are required in the great majority of cases, but they ought not to be given recklessly, the nature and quantity of the stimulant to be employed being determined by the careful consideration of each individual case. Port or sherry wine, or spirits, especially brandy, answer best as a rule, and they should be given in divided doses at regular intervals, *by night*, as well as by day. It is well to begin with a *small quantity*, and gradually increase this, as circumstances indicate, it being again reduced as the symptoms improve. Stimulants are not usually required during the first few days, but in the case of the aged, the intemperate, and those who are much debilitated from any cause, they are called for at the outset. The *signs* which chiefly indicate the necessity for alcohol are: 1. A feeble state of the circulation, as shown by the pulse, heart's impulse and sounds, tendency to capillary stasis, or any proneness to syncope. 2. The existence of "typhoid" symptoms, with a brown and dry tongue, &c., and the amount needed is in proportion to the intensity of these symptoms. 3. A large amount, and dark color of the eruption, with abundant petechiæ. 4. Profuse perspiration, the other symptoms not improving. 5. Coldness of the extremities. 6. The existence of complications. On the other hand, it is contraindicated by a very hot and dry skin, by symptoms of much cerebral excitement, or by conditions of the urine pointing to deficient elimination on the part of the kidneys. In all cases, the propriety of continuing or increasing stimulants must be judged of by the effects produced.

General Therapeutic Treatment.—If a case of typhus is seen at an early period, many recommend the administration of an emetic. The bowels should be kept open daily by some mild aperient, or by the use of simple enemata. In order to keep up *free elimination*, it is advisable to allow the patient plenty of drink, which may contain citrate of potash, nitre, cream of tartar, or chlorate of potash, from ʒi to ʒij of either of these being taken in the 24 hours. Tea, coffee, and salt are also recommended to be taken for this purpose. *Mineral acids* have obtained great repute in the treatment of typhus. Nitric, hydrochloric, or a combination of these, sulphuric, and phosphoric acids, are those chiefly employed. They may be either made into a drink, or given in 10, 20, or 30 minim doses, every three or four hours. Sulphuric acid answers best when typhoid symptoms come on. *Quinine* is another valuable remedy, given in moderate doses, and personally I always combine it with acids in the treatment of cases of typhus. *Tincture of iron* has also been highly recommended.

Various *antiseptics* have been tried, viz., carbolic acid, sulphocarbolates, creasote, sulphites, Condy's fluid, peroxide of hydrogen, &c., but it does not appear that they are to be relied upon.

The symptomatic treatment is often a matter requiring considerable attention. The *heat of skin* is best moderated by tepid or cold sponging. Severe *vomiting* sometimes needs special treatment. *Head symptoms* frequently call for interference. *Headache* is best relieved by removing the hair, and applying cold, or using cold affusion. In the aged and feeble, however, warm applications are best. In the young and robust, if the headache is very severe, Murchison has found two to four leeches give relief. Dry cupping to the nape of the neck is sometimes useful. It is very important to *procure sleep*, and for this an *opiate* may usually be given. When *violent delirium*, with excitement, exists, the opiate should be combined with *tartar emetic*, or if the *delirium* is of the *low type*, it may be given with alcoholic stimulants, ether, or camphor. Opium is contraindicated if there are signs of interference with the respiratory functions, if there is any tendency to stupor, or if the pupil is greatly contracted. Belladonna, *hyoscyamus in full doses*, *hydrate of chloral*, and chloroform internally, are the remedies, which have been recommended as substitutes for opium under these circumstances.

Stupor is to be counteracted by promoting the action of all the excretory organs, applying external stimulants, and giving diffusible stimulants internally. Strong coffee is very valuable under these circumstances; cold douching may also be employed.

When there is very great prostration it is necessary to administer sulphuric or chloric ether, camphor, musk, or carbonate of ammonia, along with alcohol. In some cases the patients get so low that they cannot swallow, and then recourse must be had to *nutrient and stimulant enemata*, which should be persevered in to the last. It has been recommended to give opium by enema.

It is always very necessary to look to the *state of the bladder*, and draw off the urine, if necessary. The various *complications* met with must also be watched for, and every care taken to prevent them, especially *pulmonary complications*, and *bed-sores*. If they occur, or any *sequelæ*, appropriate treatment must be adopted, it being borne in mind that stimulants and tonics are indicated, when inflammatory affections set in in typhus.

Much care is requisite during the period of convalescence, all overexertion being avoided, as well as excessive eating. Tonics and change of air are very beneficial. It is especially necessary to guard against any sudden effort during the early period of convalescence, as this may lead to coagulation of blood in the veins.

TYPHOID FEVER—ENTERIC FEVER—PYTHOGENIC FEVER—ABDOMINAL TYPHUS.

ETIOLOGY.—For a long time much discussion was carried on as to whether typhus and typhoid fever are due to the same specific poison, or whether they are distinct and independent diseases. At present it is almost universally recognized, that they are totally different affections, though a few still hold that they are identical.

Another subject of dispute has been, whether typhoid fever is capable of being communicated from one individual to another. There is abundant evidence to prove that it is so transmitted; in short, that it *spreads by contagion*, and when once it find its way into the midst of a number of individuals, it tends to attack many or all of them. Most important is it to understand clearly in what the contagion chiefly exists, and how it gains access into the system. The exhalations do not appear to contain much of it, and there is very little danger from merely coming into the vicinity of typhoid patients. Indeed, the probability is, that the disease cannot be transmitted in this way, and medical men or nurses rarely take it from attending on patients. Fomites never convey the contagion. It is in the *stools* that the poison is contained, and through them the disease is propagated. The atmosphere may become impregnated with the emanations from the excreta, either because they are thrown into some open space, or because the water-closets, privies, sewers, &c., are imperfect, and these may thus find their way into the system. *Water* is, however, the great channel by which the poison is conveyed, and numerous epidemics and endemics of typhoid fever have been traced to some special water-supply, as well as sporadic cases. The materials may soak through the soil from cess-pits, or from being merely thrown on the ground, and thus get into wells, the water of which is used for drinking purposes; or they may find their way into cisterns, through the waste-pipes.

The name "pythogenic" has been given to typhoid fever by Dr. Murchison, who, with others, is strongly of opinion that it is, as a rule, *spontaneously* originated by ordinary sewer emanations and putrefying animal matter, and he believes that, even in the specific stools, the poison is always the result of decomposition.

Predisposing Causes. Age.—Typhoid fever is far most common during youth and adolescence. It is very rare in young infants, and persons beyond 45 or 50 years of age. Individuals under 30 are twice as liable as those over 30, and half the cases occur from 15 to 25 (Murchison). *Sex* does not seem to have any influence.

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Cases are most numerous during autumn, especially after a dry and hot summer. Overcrowding is not a predisposing cause, as typhoid is frequently met with in country places where there is no crowding. Deficient ventilation may have some effect. The disease affects persons in all classes of society, and is not at all more prevalent among the poor; if anything the contrary is the case. *Individual susceptibility* is supposed to predispose, and recent comers are said to be most liable to be attacked. Persons in good health often are chiefly affected, and various chronic and acute diseases, as well as pregnancy, seem to afford some protection against typhoid.

ANATOMICAL CHARACTERS.—The *general condition* of the body will vary with the time at which death occurs. Usually there is much emaciation, rigor mortis is distinct, and of moderate duration, and there is not the excessive post-mortem congestion, rapid putrefaction, and dark color, with softening of the muscles, which are met with in typhus. The eruption is not persistent after death, but there may be evidences of bed-sores, gangrene, erysipelas, or sudamina.

Alimentary Canal.—It is here that we find the most important morbid changes in enteric fever. The *pharynx and œsophagus* may be congested, inflamed, covered with diphtheritic deposit, or the seat of ulceration. The ulcers are generally very superficial, and are never met with before the third week. They are not the result of any morbid deposit. The *stomach* occasionally presents hyperæmia, mammillation, softening, or superficial ulceration, but is, as a rule, normal. The *small intestines* are rarely distended with gas; they contain more or less of the materials similar to those passed in the stools. Increased vascularity of the mucous membrane may be observed, either uniform or in patches, but it is by no means necessary; it is most evident towards the lower part. At a later period, the color may be grayish or slate-colored. Swelling and softening of the membrane sometimes exists, the latter being probably post-mortem.

The *characteristic lesions* of enteric fever consists in *certain morbid changes in connection with Peyer's patches and the solitary glands.* According to the time at which death occurs, will these present different appearances, which are divided into stages:

1. *Stage of deposition or enlargement.*—The first alteration is an enlargement of Peyer's patches and the solitary glands, owing to the presence of a morbid substance, supposed by some to be of the nature of a specific deposit from the blood undergoing a peculiar development, but generally considered to be the result of a proliferation of the cell-elements previously existing. It is made up chiefly of granular matter, and oil-globules, with a variable number of cells, of no special character. This material is probably first formed *within* the glandular sacs, but these may burst, and discharge their contents into the surrounding cellular tissue, or there may be an increase of cells here also.

It is a matter of doubt at what period the enlargement commences, and whether it is preceded by hyperæmia. Murchison, states there is no previous congestion, and that a deposit has been met with on the 1st or 2d day, but Trousseau gives the 4th or 5th day as the time of its appearance.

Peyer's patches appear prominent, being raised one to two lines above the mucous membrane, or even more, with steep edges, and a smooth or granular surface; they are more or less hard, though the membrane covering them is often softened; they vary in color, being pinkish-gray, or of different hues of red, the mucous membrane over them being sometimes purplish, and each is surrounded by a vascular ring. The peritoneum is also injected. The substance seems adherent to the mucous and muscular coats. On section it appears as a soft, grayish-white or pale-reddish material.

Two forms of patches are described, the *plaques molles* and the *plaques dures*, but there are gradations between them, and they may coexist. The latter are more prominent and firmer, and the membrane over them is smoother and more uniform. The difference between them is, that in the former the deposit is less abundant, and confined to the glands, which in the latter have burst, and discharged their contents (Murchison).

The *solitary glands* are not always involved. Exceptionally they may be alone affected. They vary in size from a millet-seed to a pea, and sometimes look like pustules.

2. *Stage of softening and breaking down.*—In rare instances it appears possible for the material to be reabsorbed without any breach of surface occurring. Almost always, however, ulceration

takes place, the average time at which this sets in being about the 9th or 10th day, but it may be much earlier or later than this. The ulcer is commonly formed by the death of the patch and the membrane over it, the whole separating as a single slough, or in separate irregular portions. These sloughs are yellowish or yellowish-brown from staining, or they are sometimes dark, from blood; they may be seen in process of separation, hanging loosely. There may be merely superficial abrasion and softening of the mucous membrane, preceding ulceration. Sometimes the glands merely rupture and discharge their contents, producing a net-like appearance, and Aitken believes this is the most frequent mode of elimination of the softened deposit.

3. *Stage of Ulcer.*—The characters of *typhoid ulcers* are as follows: In size they usually vary from a line to 1½ inch, but if several ulcers join, a surface of some inches may be involved. The shape is oval or elliptical, round, or irregular, according as the ulcer corresponds to a patch, to a solitary gland, or to several united. There is never any thickening or hardening of the edges or floor, or any morbid deposit here. The margin consists of a "well-defined fringe of mucous membrane, detached from the submucous tissue, a line or more in width, and of a purple or slate-gray color; this is best seen when the bowel is floated in water" (Murchison). The floor is formed by the submucous, muscular, or peritoneal coat, and the ulcer accordingly varies in depth. Those ulcers which correspond to Peyer's patches occupy the part of the intestine most distant from the mesentery, and their long diameter is longitudinal and not transverse, as regards the direction of the intestine.

4. *Stage of Cicatrization.*—This stage commences usually about the end of the third week, but it may be delayed considerably beyond this, the ulcers becoming chronic or atonic. Each ulcer takes about a fortnight to cicatrize. Healing takes place without any puckering, contraction, or constriction of the gut. A thin, transparent layer of lymph forms on the surface, by which the mucous membrane becomes gradually attached to the floor from the periphery to the centre, and into which at last it passes imperceptibly. The cicatrix is slightly depressed, thinner at the centre, paler, smooth, and translucent. After a time the mucous

membrane may become movable, and it is said villi may form, but if the glands are destroyed, it is not likely that they are renewed.

The changes thus described begin first, are most extensive and most advanced, in that part of the intestine where Peyer's patches are most evident, viz., in the lower portion of the ileum, and from this point they gradually extend upwards, and may occupy the lower third of the small intestine. The extent of the disease is, however, very variable, the number of patches involved being from 2 or 3 to 30 or 40. Generally at a post-mortem examination different stages of the morbid changes are seen in different parts, being most advanced below, and it is here that the extensive ulcerations are observed. At the upper part there is, as a rule, a somewhat abrupt transition from diseased to healthy patches, and all are usually affected beyond the first diseased patch. The *solitary glands* are generally only involved in the lower 12 inches of the gut, and they ulcerate later than the patches. They are more liable to be attacked in children.

Perforation is an event to be dreaded in the case of "typhoid ulcer." It may occur,—*a.* Most frequently by molecular disintegration, or an extension of ulceration, producing one or more minute, round apertures, like pinholes. *b.* By more or less extensive sloughing, involving the peritoneum, the slough separating partially or completely, and producing an opening of variable size. *c.* By rupture or laceration, leading to an elongated perforation, and this may happen even after cicatrization. Generally there is but one perforation, but occasionally 2, 3, or more. In most cases it occurs in the lower portion of the ileum, but may be higher up or in the large intestines.

If a case of typhoid fever lasts a long time, it is said that considerable atrophy of the coats of the intestine takes place, as well as of the glandular structures.

Large Intestines.—Gaseous distension is usually present, and may be extreme. The mucous lining may be congested or softened. Deposit and ulceration not unfrequently occurs in connection with the solitary glands, these changes being, as a rule, limited to the cæcum and ascending colon. The ulcers are generally small and circular, but may be 1½ inch long, with the long diameter transverse. In a fatal case of typhoid which has just been under my care at University Hospital, the *morbid appearances existed chiefly in the cæcum and ascending colon.* Here there were at least 20 ulcers, some as large as half-a-crown, and though none had actually given way, two or three ruptured during the removal of the intestines. In the small intestines there were not altogether above half a dozen ulcers, and *these were confined to the solitary glands,* Peyer's patches appearing very little altered. Peritonitis existed, from extension.

Lacteal and Lymphatic Glands.—The *mesenteric glands* always present important changes, these being associated with the morbid conditions in the intestines, and being most marked in those glands corresponding to the part of the gut most diseased. They become enlarged *from the outset,* not merely as the result of irritation, but from an increase in the lymphatic elements, similar to that which occurs in the intestinal glands. They continue to enlarge up to the 10th or 14th day, present a red or purplish color, and are tolerably firm. On section they sometimes present little opaque, pale-yellow, friable masses. Subsequently these may soften into a pus-like fluid, with sloughs, and the glands in rare instances actually burst into the peritoneum. After the softening process begins in the intestinal glands, the mesenteric glands also soften, and become smaller. Ultimately they frequently become tough, contracted, and shrivelled, pale, or of a gray or bluish color, and occasionally calcify. The mesocolic glands are similarly altered when the colon is involved.

Other glands may enlarge from irritation.

Spleen.—This organ is almost always much enlarged, especially in young persons, very dark in color, and softened. Sometimes it contains opaque, yellowish-white masses. It may be quite pulpy, and has been known to rupture.

Liver and Gall-bladder.—The *liver* is sometimes congested or softened. The *gall-bladder* may be the seat of catarrhal or diphtheritic inflammation, or of ulceration. After 3 or 4 weeks the bile is often thin, watery, almost colorless, and acid in reaction.

Peritoneum.—*Peritonitis* is not uncommon, and may be either extensive, or circumscribed, limited abscesses sometimes forming. It may arise from mere extension, or from intestinal perforation, rupture of glands or spleen, or perforation of an ulcer in the gall-bladder.

Urinary Organs.—The *kidneys* are sometimes congested, or have their tubes choked with epithelium. The mucous coat of the *bladder* may be congested or inflamed.

Blood and Organs of Circulation.—There is nothing very special here. The *blood* is dark and fluid, and does not coagulate, if there have been typhoid symptoms before death, but this is rare, compared with typhus. The white corpuscles are increased, and disintegrating red corpuscles are sometimes seen. The *heart* may be a little softened.

Respiratory Organs.—There may be congestion, various forms of inflammation, œdema, or ulceration in the *larynx*, the last not being due to any specific deposit. Signs of bronchitis, hypostatic pulmonary congestion or œdema, pneumonia, or pleurisy, may be evident. The *bronchial glands* are sometimes enlarged.

The *nervous system* presents no particular alterations. There may be excess of serum in connection with the brain and its membranes.

SYMPTOMS. I. *Incubation stage.*—*The period of incubation* is of doubtful duration. It is said to average from one to two weeks, and there are no distinctive symptoms. Sometimes it appears to be very short, if the poison is concentrated, the disease setting in with vomiting and purging, attacking a number of persons at the same time, and giving the idea of irritant poisoning.

II. *Actual attack.*—It is scarcely possible to divide this affection into distinct stages. *Invasion* is, as a rule, *very indefinite and gradual*, and the patient cannot fix the exact date of the commencement of the attack. *Frontal headache*, with giddiness and noises in the ears; *general pains in the limbs* with a feeling of lassitude and illness, restlessness, and disturbed sleep; *slight, irregular chills, diarrhœa*, with loss of appetite, furred tongue, and not uncommonly nausea and vomiting, are the ordinary symptoms. Sometimes there is much abdominal pain. *Diarrhœa* may be the only prominent symptom for some time. Occasionally repeated epistaxis occurs. Soon there are signs of pyrexia, increasing towards evening. It usually happens that the patient does not feel sufficiently ill to lay up for some days, but follows his occupation, and it is a frequent observation, that patients come to the hospital after having been ill for many days, thinking there is not much the matter with them, and they sometimes walk about during the entire illness.

Murchison has seen cases in which at first typhoid fever resembled ague.

The *disease being established*, the symptoms present during the first week or ten days are as follows:

The *general appearance* does not indicate any great prostration; and though a certain degree of this is felt, it is not very marked. The *expression* presents nothing peculiar, and the face is pale, or a pink, circumscribed flush exists on one or both cheeks, varying in depth of tint, and not constant. Pyrexia exists, the skin being hot and usually dry, but sometimes moist, and the *pulse* accelerated, being up to 100 or 120, and somewhat weak and soft; it varies in frequency in the same patient, being readily accelerated, and is generally higher at night. The *tongue* presents usually a thin, whitish fur, is moist at first, small and pointed, red at the tip and edges, with enlarged papillæ. In exceptional cases it is large, and thickly coated, or red, smooth, and glazed. The lips are parched and dry, and the mouth slimy. There is much thirst, with loss of appetite, and often nausea and vomiting.

Abdominal symptoms are prominent as a rule. These are, *pain and tenderness*, especially in the *right iliac fossa; tympanitic distension; gurgling in the right iliac fossa; diarrhœa;* and *enlargement of the spleen;* sometimes *intestinal hemorrhage* occurs. The *diarrhœa* varies in amount considerably, the stools numbering from two to twelve, twenty, or more in the twenty-four hours. Usually they are from three to six. At first they present nothing peculiar, but after a few days they have special characters. They become thin, yellow, pultaceous, somewhat resembling pea-soup in appearance; very offensive, and often ammoniacal; and alkaline in reaction. At first uniform throughout, they separate on standing into an upper, watery layer, of a yellowish or brownish color, containing albumen and salts in solution, the latter including chloride of sodium and carbonate of ammonia; and a lower layer, or deposit, consisting of the remains of food, epithelium, and mucus corpuscles, blood, small yellow flocculi, shreds of slough, and crystals of triple phosphates.

Head symptoms are not very marked at this time. Frontal headache persists, with dizziness, and buzzing in the ears. Sleep is restless and disturbed, but the mind is unaffected, though inactive, and there is no delirium, even at night. Epistaxis not unfrequently occurs.

The *urine* presents well-marked febrile characters, urea and uric acid are in excess, and chloride of sodium diminished.

A *specific eruption* is present in the great majority of cases, but not invariably. It is not unfrequently absent in the very young, and in persons over 30. It first appears usually from the 7th to the 12th day, but may, in rare instances, be seen on the 4th, or not until the 20th. The abdomen, chest, and back are the regions which it occupies, but it is occasionally observed on the limbs, or very rarely, on the face. It *does not appear all at once*, but comes out in *successive crops*, each spot lasting from two to five days, and then fading completely. The *amount* of eruption present at one time is never great, the number of spots rarely exceeding from 12 to 20 or 30, and they may be but two or three. They continue to come out often until the 28th or 30th day, or sometimes even longer. Murchison found the average total duration to be about 14½ days. The eruption appears earlier, and lasts a shorter time, in children.

Characters.—The eruption consists of separate spots, round, lenticular, or oval in shape, and varying in diameter from ½ a line to 2 lines. They are slightly but distinctly elevated as a rule, rounded at the surface, with a well-defined margin, and feel soft. They have a pinkish or rose color, which, throughout their whole course, disappears completely on pressure, and which gradually fades away. Petechiæ are never produced; very rarely the spots may be minutely vesicular. They never persist after death.

Frequently there are slight bronchitic symptoms, with dry râles over the chest.

The symptoms thus far described may continue until convalescence sets in, without any particular change, the tongue remaining moist throughout, and there being no great prostration, or severe nervous symptoms. As a rule, however, more or less alteration occurs in the phenomena observed. The patient emaciates and becomes much weaker, being sometimes very prostrate. The face is more flushed, the conjunctivæ may be injected, and the pupils are dilated. The fever continues, and the *pulse* is more frequent, but weaker. The *tongue* tends to become dry and brown, or red, shining, and deeply fissured, while sordes collect on the lips and teeth, the breath having a very disagreeable odor. Labial herpes is not uncommonly present. There is no diminution in the abdominal symptoms, which often are intensified, and *hemorrhage from the bowels* is apt to occur. The spleen also becomes larger.

The *nervous symptoms* undergo a marked change. From the 10th to the 14th day the headache and general pains cease, but there is more giddiness, with deafness. At the same time the mind is affected, as indicated by more or less somnolence, confusion, and delirium. The latter is at first only nocturnal, but may become continuous, though it is usually worse at night, while drowsiness is more marked by day. It is generally of an active, noisy, and talkative kind at first, and may be very violent, the patient throwing off the bed-clothes, trying to get up constantly, and having various delusions. Sometimes the patient lies in an apathetic state, with half-closed eyes, appearing to understand what is said and done, but unable to make intelligible replies. *Epistaxis* is not uncommon at this time.

Sudamina may appear, usually in the third or fourth week, especially over the chest and abdomen, and on the sides of the neck. *Bed-sores* are liable to occur in parts which are pressed upon.

The *respirations* are hurried and shallow, and there are more marked signs of bronchial catarrh. The *urine* becomes more abundant, of lighter color, and lower specific gravity; slight albuminuria may occur, but is not very common. Sometimes the *urine* is retained, or passed involuntarily with the stools. Rarely it contains blood, renal epithelium, or casts.

In some cases the ordinary *typhoid* symptoms arise, as described under typhus, petechiæ, at the same time, occasionally making their appearance, but this is an exceptional course of events.

Typhoid fever, when it ends in recovery, presents a *gradual* subsidence of the symptoms, there being *no crisis*. Defervescence is by *lysis*. Convalescence makes slow progress, and is liable to be retarded by a *relapse*, and by complications or sequelæ.

Temperature.—Typhoid fever presents some very characteristic features as regards its temperature. The *ascent* is quite regular and gradual, and continues for four or five days. *The evening temperature is about 2° higher than that of the morning, and there is a remission each morning of about 1° compared with the previous evening*, so that *there is a daily rise of about* 1°, and at last the evening temperature comes to be from 103.5° to 104°. This mode of ascent is quite distinctive of typhoid.

The *stationary* period varies greatly in duration, according to the severity of the case. The temperature is usually between 104° and 106° in the evenings, and only a *slight morning remission* is observed. It may even reach 107° or 108°.

The *decline* is also peculiar. It takes place gradually, and is first indicated by a *more distinct morning remission;* in three or four days, the *evening* temperature falls, and the *morning remissions become very considerable*, a difference of 2°, 3°, or even more being observed. The time taken to reach complete defervescence, so that *evening temperature is normal*, varies much. Complications and sequelæ will also lead to irregularities, and a *relapse* may cause the temperature again to rise in the same regular manner as at first.

The value of temperature, as indicating *prognosis*, will be again alluded to.

VARIETIES.—Remarkable differences are presented by cases of typhoid fever, both in their degree of severity, and in the prominent symptoms which are present, and sometimes it is a matter of considerable difficulty to come to any positive diagnosis, no characteristic symptoms being present. For instance, in some cases there are no abdominal signs, and the bowels may be constipated throughout.

Murchison gives the following varieties:

1. *The mild form*, under which would be included the *abortive* variety of certain writers, which ends in the second or beginning of the third week, as well as some cases considered to be of the nature of febricula.

2. *The grave form*, which, according to the prominent symptoms present, is subdivided into: *inflammatory, ataxic, adynamic, irritative, abdominal, thoracic*, and *hemorrhagic*.

3. *The insidious* or *latent form*, also called *ambulatory*, because the patient often walks about during the whole attack. Sudden death may occur in such cases from perforation or hemorrhage.

In addition to these, there can be no doubt that the affections named *infantile remittent fever*, and *gastric* or *bilious fever*, are usually merely modified typhoid.

COMPLICATIONS AND SEQUELÆ.—Affections of the respiratory organs are apt to occur during the course of typhoid as well as typhus; those which are more common in the former than the latter being *pneumonia, pleurisy*, and *acute tuberculosis*. Various other complications, mentioned under typhus, occasionally are met with. Those that are specially to be dreaded in typhoid, however, are *perforation of the intestines* and *peritonitis*. The former generally happens in the third or fourth week, but it may occur as early as the eighth day, *or not until the patient is apparently almost convalescent*. It is very frequent in the latent variety. Usually it produces the ordinary symptoms of perforation (to be described hereafter), but sometimes they are very obscure.

Peritonitis may be general or local. Its causes have been mentioned, when speaking of the morbid anatomy.

The most important *sequelæ* are phlegmasia dolens, phthisis, mental weakness, temporary general or partial paralysis, neuralgia, otorrhœa, anæmia, and a general state of ill-health, with debility and wasting. The last condition is due to destruction of the villi and glands of the intestines, and shrivelling of the mesenteric glands.

Diagnosis.—In typical cases it is easy enough to recognize typhoid, its chief signs being pyrexia, with the *peculiar course of temperature, frontal headache*, the *abdominal symptoms and enlarged spleen*, a *peculiar eruption*, followed by prostration, delirium, epistaxis, intestinal hemorrhage, &c. In many cases, however, there is considerable difficulty in arriving at a positive conclusion. The principal diseases for which it might be mistaken are the various fevers, especially *typhus* and *relapsing fever, acute tuberculosis, pyæmia, tubercular meningitis, pneumonia, gastroenteritis*, *renal disease with uræmia*, and *chronic peritonitis with ulceration of the bowels.* Space will only permit the consideration of the distinctions between *typhus* and *typhoid*, which may be thus summed up: 1. They occur under different hygienic conditions. 2. Typhoid is not often observed in old people. 3. Invasion is very gradual and indistinct in typhoid. 4. The appearance and color of the face differs greatly in the two diseases, and also the *condition of the pupils.* 5. *Abdominal symptoms* are prominent in typhoid, with *peculiar diarrhœa.* If the latter symptom is present in typhus, the stools present no special characters. Hemorrhage from the bowels is also frequent in typhoid. The condition of the tongue differs usually. 6. *Prostration* and *low nervous symptoms* are later in their occurrence and less severe in typhoid, even if they set in at all. 7. Hypostatic congestions are more frequent in typhus. 8. *Epistaxis* is common in typhoid. 9. The *specific eruptions* are absolutely distinctive in each case. 10. The two diseases differ completely in their *course of temperature.* 11. In typhoid the *pulse* is liable to great variations. 12. The *duration* of typhus is shorter than that of typhoid.

Duration and Terminations.—It is difficult often to fix accurately the duration of cases of typhoid, on account of its insidious mode of onset. It is generally from three to four weeks, rarely extending beyond the 30th day. Many cases terminate on or about the 21st or 28th day. The mean duration of fatal cases seems to be about 22 days. Cases, however, not unfrequently run a much shorter course, and death has been known to occur within the first few days. On the other hand, they may be more prolonged, and Murchison mentions a case in which fresh spots appeared up to the 60th day. *Complications* and *sequelæ* also protract the disease, as well as *relapses*, which sometimes occur, in about ten days or a fortnight after convalescence has set in.

Typhoid may terminate in recovery, death, or a permanent state of ill-health. The *average mortality* is about 1 in 5.4 cases, but it differs in different epidemics. The *causes of death* are: 1. Gradual *asthenia*, or this combined with *anæmia.* 2. Direct loss of blood from epistaxis or intestinal hemorrhage. 3. Poisoning of the blood from high fever, imperfect excretion, or absorption of septic matters. 4. *Complications*, especially *perforation* and *peritonitis*.

PROGNOSIS.—Until a patient is quite convalescent it cannot be considered that all danger is past, and a guarded opinion should be given as to the result, *even in the mildest cases*. The *prognosis* is rather worse in females, in those advanced in years, and in persons who have come recently to an infected district. Family constitution seems to have some influence. Previous debility has not much effect.

Many of the conditions mentioned as being unfavorable in typhus are also unfavorable in typhoid, especially severe nervous symptoms, and great prostration, but the pulse and tongue are not so much to be relied upon, and *profuse eruption is not a bad sign* in typhoid. The chief indications of danger are—severe abdominal symptoms, with excessive diarrhœa; intestinal hemorrhage, especially if profuse; *signs of perforation; symptoms of peritonitis;* profuse epistaxis; marked muscular tremors, the mind being clear; sudden extreme prostration; aggravation of all the symptoms after a temporary improvement in the second or third week. A *relapse* rarely proves fatal.

The value of *the thermometer* in prognosis requires particular notice. During *the second week* the temperature shows whether a case is going to be severe or not. In *mild cases* a *marked morning remission* occurs, which begins early and increases; the evening exacerbation is late, and soon there is a permanent fall; in short, the stage of defervescence sets in. In *severe* cases the opposite conditions are observed. The *prognosis* is unfavorable in proportion to the *height of the temperature*, and to *the duration* of this increased heat, with but slight morning remissions. A *sudden rise*, or a rapid and *extreme fall*, is a bad sign. Considerable interruption in the ordinary course of the temperature indicates the existence of complications. A *marked fall* often warns of the approach of intestinal hemorrhage.

Treatment.—The remarks made with regard to the hygienic and general management of cases of typhus apply equally to typhoid, but there are some points which require special notice. Remembering the *mode of origin and propagation* of the poison of typhoid, every attention must be paid to the *disinfection of the* *stools*, to the *removal of all filth*, and especially to the *water supply*, as already described when speaking of the prevention of epidemics.

In all cases the patient must keep to bed from the first, and remain there until fairly convalescent.

The greatest care is necessary as to *diet*, which should be entirely liquid, nutritious, and non-irritant, and not administered too frequently. Milk, beef tea, which may be thickened with arrowroot, beef-juice, and custards are the best articles. The patient may drink toast-water, barley-water, or mucilaginous liquids, and may also have tea or coffee frequently. Fruits are not to be permitted. This caution in diet is to be observed in all cases, but especially when there is any reason to suspect that extensive ulceration exists. By proper attention to this matter many cases may be brought safely through, without any medicine whatever. Much difference in opinion has been expressed as to the employment of *alcoholic stimulants*. It is certain, however, that their indiscriminate use may do a great deal of harm, and that they are not nearly so much needed as in typhus, or at such an early period. Often they are not at all required, and it is only in the advanced stages, when the strength has been reduced, and the circulation is feeble, that they are called for usually. Their effects must be closely watched.

Mineral acids and small doses of *quinine* are the general remedies most recommended in the treatment of typhoid, as in that of typhus, but they have not appeared to me nearly so efficacious in the former as the latter. *Antiseptic* treatment is strongly advocated by some, different remedies of this class having been spoken favorably of by different practitioners, but especially carbolic acid and the sulpho-carbolates.

In the majority of cases of typhoid it is the *symptomatic treatment* which calls for particular attention. Many of the symptoms are similar to those met with in typhus and require similar treatment. The *abdominal symptoms* are the most troublesome as a rule. It is desirable to apply *heat and moisture* over the surface of the abdomen, assiduously and from an early period, either by linseed-meal poultices or fomentations. This both prevents and relieves pain, tympanitis, &c. Occasionally turpentine-stupes or sinapisms are needed.

Diarrhœa ought to be checked if it is excessive, or if the patient is very weak. Enemata of starch and opium are decidedly the best remedy for this, in my experience. Internally Dover's powder, sulphuric acid, or acetate of lead with opium, alum, chalk mixture, bismuth, vegetable astringents, sulphate of copper, and nitrate of silver, are the chief things recommended.

In those cases where *constipation* is present, great care must be exercised in the use of aperients. A teaspoonful of castor oil, or a simple enema every third or fourth day, is recommended by Murchison under these circumstances.

Pain may call for opium or morphia. If very severe at an early period in young and plethoric patients, it may be advisable to apply three or four leeches in the right iliac fossa. Blistering has also been recommended.

For excessive *tympanitis* enemata, containing turpentine or asafœtida, answer best, in addition to external applications. Passing a long œsophagus-tube into the rectum sometimes gives relief.

Intestinal hemorrhage, if not stopped by the remedies mentioned for diarrhœa, requires tannic or gallic acid, turpentine, or tincture of iron. Ice may also be given to suck constantly, and may be applied over the right iliac region.

Should *perforation* occur, or *peritonitis* come on from any cause, the treatment should consist of *absolute rest*, the total withdrawal of food, or its administration in *very small quantities*, and the *free use of opium*. Should constipation ensue, *on no account* must aperients be given.

Epistaxis sometimes requires the use of local styptics, or the nares have to be plugged.

During convalescence much careful supervision is needed, especially with regard to food, and the use of purgatives. The diet must be very gradually improved, and only taken in moderate quantities. Wine is valuable at this time. If an aperient is required, a small dose of castor oil or a simple enema answers best. Tonics and change of air are very beneficial.

RELAPSING FEVER. FAMINE FEVER.

This fever has attracted considerable attention of late years, owing to epidemics of it having occurred in different places. An excellent account of an epidemic which took place in Liverpool, is given by Dr. de Zouche, in vol. v of the Liverpool Hospital Reports, 1871.

ETIOLOGY.—*Relapsing fever* is an acute specific disease, produced by a *specific poison*, and is very infectious. It often spreads rapidly, and this occurs in proportion to the freedom of intercourse between the sick and healthy. Dr. de Zouche places it next to small-pox, as regards its degree of contagiousness, and states that when it gained access into a house, it usually attacked every inhabitant. The contagion is chiefly contained in the breath and exhalations, and, as in typhus, those who come much into contact with patients are most liable to be attacked. It may be conveyed by individuals or "fomites," and clings tenaciously to a house for months. The anti-hygienic conditions which promote the spread of typhus, have a similar influence in the case of relapsing fever, and Murchison believes that it may be *spontaneously produced*, especially as the result of *destitution*. It is supposed by some that typhus and relapsing fever are identical, the former being only a severe form of the latter, but they are generally held to be distinct diseases.

ANATOMICAL CHARACTERS.—There are no post-mortem appearances at all characteristic of relapsing fever. Petechiæ and jaundice are persistent, if they exist before death. The blood frequently contains much urea, and the white corpuscles are increased. Occasionally it is dark and fluid. The *spleen* is usually much enlarged during the febrile paroxysm, and softened; sometimes it contains fibrinous deposits. The *liver* is also enlarged and congested, but neither this organ nor its duct exhibits any condition likely to account for the jaundice present. Evidences of the different complications may exist after death.

SYMPTOMS.—The *period of incubation* lasts from about four to ten days usually, but may be very much shorter, the attack even appearing to set in almost simultaneously with exposure in exceptional cases.

The *invasion* is remarkably sudden, the patient usually feeling perfectly well immediately before, and being able to fix upon the exact moment of attack. It often sets in on first awaking in the morning. Generally, however, constipation has existed for some days previously (De Zouche). The attack is commonly ushered in with a *severe rigor*, and a sense of *great weakness*. *Sharp frontal headache* is felt at once or very soon, which rapidly increases, with giddiness, and there are *pains in the back and limbs*, which are often exceedingly severe. After a variable time, the rigor is followed by marked fever, the skin being dry and pungent, with flushed cheeks, the pulse frequent, and thirst excessive. In two or three days profuse and general perspiration follows the heat of skin in some cases, but gives no relief. The rigors are repeated at intervals, and may alternate with sweatings, simulating ague. In children, the disease may commence with a "heavy sleep." Vomiting and retching are early symptoms, the vomited matters being yellow, yellowish-green, or green, and consisting of bile and gastric secretions; sometimes they are black. Epigastric uneasiness or pain, and pain or tenderness over the liver and spleen are also complained of, these organs, especially the latter, being enlarged. Appetite is quite lost as a rule, and there is great thirst throughout. The *tongue* is at first moist, and covered with a white or yellowish fur, and generally remains so, but it may become dry and brown, with sordes on the teeth. It is often transversely fissured and red at the edges, with enlarged papillæ. In bad cases patches of ulceration are observed on the tongue and cheeks. Constipation generally persists throughout, the stools being normal in color or dark. Sore throat is frequently complained of, and the fauces are reddened, and one or both tonsils enlarged.

The appearance of the patient is often quite characteristic. "The eyes appear somewhat sunken, from the dark circle which surrounds them; they are clear, but have a despairing woebegone look, not easily to be forgotten if once seen. The whole face expresses the consciousness of pain and helplessness" (De Zouche). More or less jaundice is often present, and sometimes the skin exhibits a bronzed hue. Various eruptions have been described, as occurring in individual cases, but there is nothing of this nature at all specific.

The *pulse* rises rapidly to 100, 120, 140, or even 160. It may be full and strong, but in bad cases tends to be weak, intermittent or irregular, the impulse and sounds of the heart being at the same time feeble.

The *urine* is febrile; it may be much diminished in quantity, or suppressed, and urea is often deficient. It rarely contains albumen.

The *headache* continues very severe throughout, with a throbbing sensation, and there is great restlessness and sleeplessness. Delirium is uncommon, but is occasionally observed, especially towards the crisis, when it may be violent.

The symptoms become intensified towards the period of the *crisis*, which event occurs in most cases on the 5th or 7th day, but may take place from the 3d to the 10th day. They are often alarming at this time, and attended with much dyspnœa. Crisis almost always is accompanied with profuse sweating, the perspiration pouring off for some hours. Sometimes sudamina appear, and occasionally watery diarrhœa or vomiting occurs. Hemorrhages are not uncommon, especially epistaxis, and occasionally menorrhagia, or hemorrhage from the bowels. In severe cases, and in weak individuals, a copious and general petechial eruption is often observed at this time. The symptoms generally rapidly abate, the pulse and temperature fall, even below the normal, the former often continuing infrequent, the tongue clean, and the patient often feels quite restored, only being a little weak. Most patients soon get up, and some try to work.

In exceptional cases, there may not be a complete cessation of symptoms, but only a partial remission. In other instances severe muscular and arthritic pains are complained of over the body generally, the metacarpal and phalangeal joints being most liable to be attacked. These prevent sleep, and make the patients cry out. At this time the disease may be mistaken for acute rheumatism, especially as some of the joints occasionally become swollen.

Bronchitis may set in during the intermission, with much spasmodic cough, and expectoration of viscid, tenacious mucus, or even blood; it sometimes resembles whooping-cough, especially in children.

Relapse.—Occasionally no relapse occurs, especially towards the end of an epidemic, or it is scarcely noticeable. Dr. De Zouche states that he was always able to ascertain, on close questioning, that a relapse had taken place. It may take place at any time from the 12th to the 17th day, generally on the 14th. Its onset is equally sudden with the primary attack, and the symptoms are precisely the same, their intensity being, however, usually less, though they are, in exceptional cases, more severe. The average duration of the relapse is from three to five days, but it may vary from a few hours to seven or eight days, and it terminates by crisis, usually in the same manner as the first attack. A second, third, fourth, and even fifth relapse has been sometimes observed.

In rare instances extreme prostration suddenly comes on, with signs of collapse, the face being of a purplish color, especially the nose, the limbs cold and livid, the pulse very feeble, and the patient becoming unconscious. In other cases there are typhoid symptoms, or severe nervous symptoms with suppression of urine.

Temperature.—There is a *continuous ascent* for four or five days, without any evident morning remission, the temperature reaching 104°, 105°, 106°, or even 108°. It may then remain stationary, with slight morning remissions, until crisis occurs, when it falls below the normal; at the relapse it again rapidly rises, and may reach even a higher point than during the first attack. It suddenly falls again at the second crisis.

COMPLICATIONS AND SEQUELÆ.—The most important are *bronchitis*, pneumonia, *various hemorrhages*, sudden syncope, *pains in the muscles and joints*, occasionally with effusion into the latter, *a peculiar form of ophthalmia preceded by amaurosis, diarrhœa or dysentery*, œdema of the legs, due to debility and anæmia, which also causes an anæmic murmur, parotid or other buboes, and *abortion.* De Zouche observed in many cases fine desquamation of the cuticle about the second week after crisis, and also falling off of the hair.

DIAGNOSIS.—At first it may be difficult to distinguish between relapsing fever and other affections of a pyrexial character, but the only two which call for special notice are typhus fever and yellow fever.

Relapsing fever is distinguished from *typhus* by—

1. Its mode of onset and pecular course.
2. The symptoms which are prominent in each, and which may be thus arranged:

Relapsing Fever.	*Typhus Fever.*
a. Very frequent pulse at an early period, with a high temperature.	*a.* Pulse less frequent, very feeble.
b. Severe pains in the limbs and joints.	*b.* Sense of great weakness.
c. Jaundice, not uncommon.	*c.* Peculiar eruption on the skin.
d. Vomiting and pain in epigastrium.	*d.* Severe nervous symptoms are common.
e. Tenderness and much enlargement of liver and spleen.	*e.* Dusky appearance of the face, and signs of prostration.
f. Not great prostration as a rule.	*f.* Signs of softening of the heart.
g. Epistaxis and other hemorrhages common.	
h. Anæmic cardiac murmur is frequently observed.	

3. The difference in the mortality.
4. The complications and sequelæ, especially *abortion* and *ophthalmia.*

From *yellow fever* it differs in its course; in attacking especially the poor and destitute; in the rarity of black vomit, and comparatively infrequent occurrence of jaundice; and in being rarely fatal.

TERMINATIONS.—The great majority of cases of relapsing fever recover; out of a large number collected by Murchison, the mortality being only 4.75 per cent. Convalescence, however, is often tedious, and a low state of debility may be left, which may ultimately prove fatal. Death results from syncope, collapse, nervous exhaustion, excessive diarrhœa or dysentery, uterine hemorrhage, especially after premature labor, uræmia, excessive vomiting in children, pneumonia, peritonitis, or other complications.

PROGNOSIS.—This is generally favorable, but is less so in the old, and in those lowered by disease, intemperance, or privation.

The chief signs of danger are marked jaundice, severe hemorrhages, especially uterine, extensive petechiæ, or purpuric spots, sordes, and ulcerations about the tongue and mouth, incomplete defervescence after the first crisis, suppression or great diminution of urine, severe cerebral symptoms, signs of syncope, and the presence of dangerous complications. It must be remembered also that serious symptoms may come on quite suddenly, even in a mild case. Convalescence is often considerably delayed, on account of sequelæ.

TREATMENT.—During the first febrile paroxysm it is desirable to keep the bowels regularly open, but not to purge excessively. If the case is seen early an emetic seems to be useful. Attention must be paid to the urine, to see that excretion is properly taking place, and saline diaphoretics and diuretics may be given. A drink containing ʒi or ʒij of nitre to the pint is recommended by Murchison. Cold or tepid sponging is very useful.

Opium is a most valuable remedy to relieve headache, sleeplessness, vomiting, and the severe pains present. De Zouche found hydrate of chloral of use. He only considers it desirable to moderate the vomiting if excessive, and for this purpose lime-water and milk, ice and effervescents, may be given. Other symptoms are relieved by the ordinary remedies. Nitro-hydrochloric acid should be administered if there is much jaundice present.

The diet should be light and nutritious as a rule, but if the patient is low a supporting diet is indicated. Stimulants are not often required, but should be given from the first if there is much debility, or if an anæmic murmur is present, or if there is any tendency to syncope. They are also called for in the case of old people, and young infants who cannot take the breast, and are in most cases necessary during the exhaustion following the crisis, and during convalescence. Complications must be treated if they arise.

During the *interval* the patient should be kept in bed, if possible. Various remedies have been tried to prevent the *relapse*, but without success. Quinine in five-grain doses may be given. The relapse must be treated on the same principles as the primary attack.

During convalescence good diet and tonics, especially quinine, mineral acids, and iron, are indicated. These seem to be the best remedies for the various sequelæ. Leeches, blisters behind the ears, calomel internally, and the local use of atropine, are recommended for the ophthalmia.

CHAPTER IV.

SCARLATINA—SCARLET FEVER.

ETIOLOGY.—Produced by a *specific poison*, scarlatina is highly infectious. This poison is especially abundant in connection with the epithelium-scales which are shed, and by means of these may be conveyed to a considerable distance. Infection may arise from merely going into the room where a patient is lying ill of scarlatina, or being in the same house, or even district. A room also retains the poison, lurking in various parts, for an indefinite time, unless it has been thoroughly disinfected, and therefore may be the means of originating the disease, even for a long period after it has been occupied by the patient. The epithelium easily clings to clothes, letters, &c., and by the aid of these and other "fomites," is often carried far and wide. It has been found that it is sometimes conveyed by milk and other food. It is important to remember, that insusceptible individuals may disseminate it extensively, if allowed to pass from the sick-room and mingle with healthy persons. The disease has been produced by inoculation. Some believe it may originate spontaneously, but this is highly improbable. A second attack rarely occurs, and still more exceptionally a third, As to the time the infection lasts in a patient, there is no certainty, but it is safer to consider it as beginning with the incubation-period, and not ceasing until desquamation has been thoroughly completed.

Young children are chiefly attacked, from 18 months to six years of age, but especially from three to four. In addition to the immunity afforded by a previous attack, the liability to scarlatina decidedly diminishes with advancing years. Both sexes are equally affected. The affection is more frequent in large towns and among the poor. It always exists among us more or less, but most cases are said to occur in spring and autumn, especially from September to November; there are many exceptions to this statement however, and epidemics are but too common at other times.

ANATOMICAL CHARACTERS.—The changes found after death vary according to the severity of the case, and the parts involved. The ordinary anatomical characters may be summed up in erythematous inflammation of the skin with superficial œdema, constituting the "rash;" inflammation of the fauces and congestion with catarrh of the tubules of the kidney. These will be again more fully considered when speaking of the symptoms. Numerous complications are met with presenting the usual post-mortem appearances, and these will be again alluded to. The spleen and mesenteric glands are not uncommonly enlarged and hyperæmic.

The blood is generally deficient in fibrin and in coagulability; sometimes fibrin is in excess.

SYMPTOMS.—A typical case of scarlatina—*scarlatina simplex*—will be first described, and then its varieties, which are numerous, briefly alluded to.

I. *Incubation Stage.*—The period of incubation lasts in most cases five or six days; it may not be longer than 24 hours, or, it is believed, may extend to three weeks. Generally no symptoms are present, but the child is sometimes a little ailing, languid, and restless.

II. *Actual Attack.* 1. *Premonitory or Invasion Stage.*—The onset is usually distinct. *Chilliness* is felt, but not severe rigors, followed by pyrexia, varying in its degree, but the temperature *generally rises rapidly to* 104° *or more.* The skin feels hot and dry, and the face flushes. The pulse is very frequent. At the same time *sore throat* is complained of, and the fauces are seen to be reddened and dry, while the neck is stiff, and tenderness is felt about the jaws. *Vomiting* is often a prominent symptom, with much thirst, and total loss of appetite. The *tongue* is usually furred, and red at the tip and edges, with enlarged papillæ. Pains in the limbs, lassitude, frontal headache, and restlessness are generally present. There may be some delirium at night, and in young children the fever may be ushered in by sudden convulsions or coma.

2. *Eruptive Stage.*—The *rash* generally appears on the *second day*, but sometimes it comes out within 12 hours, or not until the third or fourth day. Its primary seat ordinarily is the neck and upper part of the chest, but it spreads rapidly to the face, and over the trunk and limbs. Sometimes it starts in the legs. It begins as minute bright-red points, which speedily coalesce to form uniform patches of greater or less extent, so that large portions of the surface may be covered with the rash. The precise tint varies, but it is usually bright-scarlet, or of a boiled lobster, or raspberry hue, though it becomes darker as the case progresses. The color is more marked in the centre of each spot, and disappears completely on pressure, soon returning again on the removal of the pressure, this being preceded by a yellowish hue. The patches are usually very distinct in the flexures of the joints. The points are not at all elevated as a rule, but occasionally separate ones are a little papular. Sudamina are frequently present, especially in adults, if the rash is intense. They are seen about the neck and chest, in the axillæ or groins, occasionally over the whole body. The skin feels dry and often in some parts rough from the existence of cutis anserina. The rash reaches its height usually about the fourth or fifth day from the commencement of the illness, and begins to fade from that to the sixth day, this occurring first in the parts first invaded by it. It has generally disappeared before the ninth or tenth day, and then desquamation sets in.

Not unfrequently the eyelids, hands, and feet are puffy. The patient feels hot and burning, and there may be much itching, or a sense of tingling.

State of the Throat.—There is more or less general redness of the fauces, with œdema and swelling. The surface is dry, or covered with viscid mucus, and thick, opaque secretion is often seen on the tonsils. They may be slightly ulcerated, or the seat of suppuration. There are the usual symptoms pointing to the throat being the seat of mischief. The glands about the angles of the jaw are enlarged and painful, and the subcutaneous tissue is sometimes œdematous and puffy. The mucous membranes of the nose, mouth, and the conjunctiva are often red and inflamed.

The *temperature* usually continues to rise until the rash attains its height, then it remains stationary, and subsides as the eruption begins to fade, either by crisis or gradually. It ranges as a rule from 104° to 106° F., but may reach 107° to 108°, or even higher in exceptional cases. There is a slight morning remission.

The *pulse* is frequent, and may be 120, 130, 160, or more; it varies in its force, but is usually strong and full. It comes down as the temperature lowers. The tongue is furred, and presents a "strawberry" appearance, owing to the papillæ being much enlarged and red, projecting through the fur, and the surface may feel rough. As it cleans it appears red, and the papillæ remain prominent, sometimes for a considerable period. Appetite is quite lost, but there is much thirst. The bowels are usually constipated. More or less headache continues; the patient is restless and sleepless, or has some nocturnal delirium.

The *urine* is febrile, with sediments of uric acid and urates, which, as well as urea, is usually increased. Chloride of sodium and phosphates are diminished in quantity. *Albumen* is often present, and renal epithelium is seen under the microscope. Sometimes the urine contains blood.

3. *Desquamative Stage.*—The symptoms subside more or less rapidly, and then the epidermis begins to separate, the process lasting a very variable period, while the amount of desquamation also differs much, being in proportion to the intensity of the rash and the number of sudamina. The *skin* feels dry and inelastic before desquamation occurs. It begins as a rule in those parts where the rash appears earliest. Where the skin is thin the epidermis comes off in small, branny scales; in other parts it forms small patches, and where the cuticle is very thick, as in the palms and soles, it peels off in extensive patches, sometimes forming a mould of the fingers or hand.

During this period the *pulse* and *temperature* frequently fall below the normal for some days. The urine is abundant and watery, deficient in phosphoric acid, and contains abundance of renal and vesical epithelium. The question of *albuminuria* will be considered separately.

The throat may remain sore, and the tonsils enlarged, for some time.

VARIETIES.—Such being the ordinary course of scarlatina, it is important to point out what varieties may present themselves in different cases.

1. In some instances the symptoms are very trifling, the temperature not being at any time higher than 101° or 102°, and only a slight rash and sore throat being present, which soon disappear. This is a *mild form* of *scarlatina simplex* or *benigna.*

2. *Scarlatina Anginosa.*—In this form the *condition of the throat* is grave, and gives rise to severe and prominent symptoms. There is extensive and deep inflammation of the tissues, the redness tending to a dark hue, the tonsils and uvula being much swollen, with sticky mucus and secretion on the surface, or sometimes diphtheritic-looking patches. Ulceration then often sets in, or occasionally gangrene, which may spread extensively, and involve the larynx. The glands about the jaw and the other structures of the neck swell considerably, and may suppurate or even slough to a variable extent. In some cases the salivary glands are involved. Much difficulty is experienced in opening the mouth and examining the throat, which is very painful, while swallowing is exceedingly difficult and distressing, and fluids are liable to enter the posterior nares during the act of swallowing. The breath is extremely disagreeable.

The *rash* usually is delayed in its appearance, is less marked or diffused, disposed to fade and return again, and its final departure is later than usual.

Often there is much swelling of the nasal mucous membrane, with offensive and irritating discharges from the nostrils, or blocking up of these by secretions. The mouth and lips are also sore and cracked, and the tongue has a darker hue than in ordinary cases.

The general symptoms are prone to be of a low type, and when adynamia is very marked from the first, the variety is sometimes named "*anginosa maligna.*"

The interference with respiration, and absorption of putrid substances from the throat, increase the tendency to a low condition. Sometimes nausea, vomiting, diarrhœa, with irritating discharges, and tympanitis, result from swallowing acrid matters.

If the case recovers, the temperature continues high after the rash has disappeared, owing to the state of the throat.

3. *Scarlatina Maligna.*—As already stated, the symptoms may take on an exceedingly ataxic or malignant character, in connection with a bad state of the throat, and the same thing may occur during any severe attack of scarlatina, especially if the patient is previously in a weak, unhealthy condition. Nervous symptoms are prominent from the first. There is much prostration, restlessness, insomnia, delirium, soon becoming muttering, followed by convulsions, stupor, or coma. The *pulse* is very feeble, rapid, small, and irregular, and the circulation impeded, the face being dusky, and capillary congestions occurring, while petechiæ are frequently observed. Respiration is hurried; the tongue is dry and brown; in some cases hemorrhages occur.

An important class of malignant cases are those in which there is extreme prostration from the first, and intense nervous depression, the poison seeming to act powerfully upon the nervous system. The child becomes faint and sick, is pale and cold, or almost collapsed; exhibits great restlessness and anxiety, and may be delirious. The *pulse* is extremely rapid, weak, small, and irregular. The depression speedily increases, the face becomes very pale, livid, or mottled, and coma or convulsions set in. The breathing is quick and irregular. The skin is cold, or alternately hot and cold, and clammy perspirations break out. Death may take place before any eruption can appear, or a slight irregular rash comes out, if the child lives long enough.

Several cases of this character are sometimes met with in the same family, its members being rapidly carried off one after another.

4. *Scarlatina sine Eruptione.*—In some cases there is fever and a sore throat, but no eruption appears. This is liable to occur in second attacks, and in some instances where albuminuria accompanies sore throat in adults, it is a matter of doubt whether this is due to scarlatina or not.

5. *Latent.*—There may be no symptoms whatever, and the fact of scarlatina having been present may be known only by

desquamation of the cuticle taking place, or albuminuria and dropsy setting in.

In addition to these varieties, others have been described, depending upon the characters of the eruption, such as "papulosa," "variegata," "pustulosa," "pemphigoidea," &c.

COMPLICATIONS AND SEQUELÆ.—1. The most frequent and important is the occurrence of *acute desquamative nephritis* and its consequences. Some look upon this *as part of the disease.* It is imperative, in all cases of scarlatina, to pay strict attention to the examination of the urine at frequent intervals, and even for some time after convalescence. Albuminuria often occurs to some extent, as in other febrile cases, and there is always renal congestion and catarrh, but these disappear as the fever subsides. The renal complication generally occurs during or after desquamation, and though exposure to cold seems to excite it in some instances, as a rule it is quite independent of this. It is due to the deficient action of the skin, which leads to excessive action on the part of the kidneys, these having at the same time to remove large quantities of waste products. Probably the scarlatinal poison itself has some influence in destroying the renal epithelium. The symptoms are similar to those of ordinary acute Bright's disease, scarlatina being, in fact, one of the most frequent causes of this affection. The *urine* is diminished or suppressed, concentrated, contains more or less blood, is very albuminous, and presents blood-corpuscles, renal epithelium, and epithelial, blood, or granular casts under the microscope. *Dropsy* sets in, beginning usually in the subcutaneous tissue, and may spread rapidly, involving the serous membranes, larynx, and lungs in some cases. More or less pyrexia is usually present, and frequently vomiting, constipation, headache, and drowsiness. There may be uræmic symptoms. This affection will be more fully described, when treating of renal diseases.

The symptoms may subside and disappear, or a form of chronic Bright's disease remains behind. In some instances it commences as a chronic affection.

2. Occasionally *dropsy* occurs, without any albuminuria, and having no obvious cause. This may rapidly disappear.

3. *The primary ulceration of the throat* may continue for some

time, and extend; or a *new form* may set in, spreading rapidly, with much sloughing, and affecting the tissues of the neck widely. Pus may find its way into the chest, or the vessels of the neck be destroyed, and fatal hemorrhage take place as a consequence.

4. The *joints* are liable to be attacked. The affection may be of a rheumatic character, or suppuration occasionally happens. I have known chronic disease of the knee-joint to be directly produced by scarlatina. The inflammation is sometimes around rather than in the joints, and it may be in connection with muscles.

5. *Serous inflammations* are not uncommon, especially pleurisy and pericarditis, being usually dependent upon renal disease or rheumatism, but not necessarily. There is a tendency to the production of pus.

6. *Bronchitis* and *pneumonia* sometimes occur, and possibly scarlatina may lay the foundation for phthisis.

7. It seems highly probable that scarlatina sometimes leads to organic affections of the valves of the heart, by inducing endocarditis. Murmurs are now and then met with during the attack, though I have never heard any, but in some instances of mitral regurgitant murmur that have come under my notice, it could only be traced to this cause.

8. *Affections of the ear* are not uncommon as complications or sequelæ. These are otorrhœa, inflammation of the tympanum and suppuration, followed by rupture of the tympanic membrane; inflammation or ulceration of the Eustachian tube, with subsequent closure and consequent deafness; necrosis of the bones, which may lead to meningitis, abscess in the brain, or facial paralysis.

9. *Abscesses* are liable to occur in different parts, especially in connection with glands, and occasionally gangrene sets in.

10. The *cornea* is destroyed in rare instances.

Diagnosis.—In the early stage the diagnosis is founded on the presence of scarlatina in the neighborhood, or exposure to infection; the sudden onset of symptoms; high fever, with rapid rise in temperature; sore throat, but no coryza; vomiting; and severe nervous disturbance. At this time it has particularly to be separated from other throat affections and diphtheria. Attention to the various points connected with the rash will generally enable this to be distinguished from all other eruptions. It may resemble measles, roseola, urticaria, or at first variola. A rash very like that of scarlatina, is sometimes observed in surgical cases.

PROGNOSIS.—The number of deaths varies greatly at different periods, but is considerable every year, and a careful prognosis should always be given. The complications which follow must also be taken into account. The disease is most fatal among very young children, and in large towns. The chief circumstances which render the prognosis grave are, bad epidemic constitution; family predisposition to a fatal termination; great depression at an early period; typhoid symptoms at any time; late eruption, or a tendency to duskiness in this, especially with petechiæ or hemorrhages; severe nervous symptoms; extensive sloughing or ulceration about the throat, and other severe complications of this character; renal inflammation and its results; or much diarrhœa and vomiting. Special allusion must be made to *pregnancy*. When scarlatina occurs during this condition, it is extremely dangerous, and may destroy life in a few hours.

TREATMENT.—In the first place the general treatment for the prevention of infection must be rigidly carried out in every particular, and it is advisable to keep the patient under observation, and to exercise great care, even in mild cases, until all desquamation has ceased, and the chances of renal complication occurring have passed away.

In ordinary cases little medical treatment is required. The bowels should be acted upon occasionally, and some saline mixture may be administered, such as one containing citrate of potash. Barley-water, lemonade, or iced water, may be given freely to drink, and a diet of milk and beef tea allowed. The skin should be carefully sponged with lukewarm water twice a day, different parts being exposed in succession, and then dried. Some recommend that oil or grease should then be rubbed in, and others advocate the addition of a little carbolic acid, Condy's fluid, or camphor, to act as disinfectants. When the fever and rash have subsided, warm baths are to be used about every other day, and the patient should be well scrubbed with carbolic acid soap, in order to get rid of all the epithelial scales.

Some of the principal conditions which call for active interference will now be considered.

For the *throat-inflammation*, sucking of ice, and inhalation of steam are all that is needed in ordinary cases. If there is much redness and swelling, these measures should be steadily persisted in, as well as gargling the throat with lukewarm water, if the patient is old enough, and the application of heat and moisture externally over the neck. It may possibly be advisable to apply a few leeches about the angles of the jaw, but very seldom. If there is anything like ulceration or gangrene about the throat, it is important to use antiseptic gargles freely, or if these cannot be employed, to make the application in the form of spray. Among the chief gargles recommended are those of carbolic acid, creasote, chlorate of potash, Condy's fluid, sulphurous acid, chloride of lime, chlorine water, dilute hydrochloric acid, common salt, and peroxide of hydrogen. Those first mentioned are the best. It may be requisite to touch ulcers with nitrate of silver or its solution.

If the throat is in a bad condition, general treatment is also most needful. Nourishing food, in the form of soups, meat extracts, milk, &c., must be given freely, as well as stimulants, especially port wine or brandy, in proportion to the debility present, which is generally considerable in these cases. I have seen many such cases do well under the influence of tincture of steel in full doses, or this combined with quinine. Various authorities recommend the internal administration of ammonia and bark, carbolic acid or sulphocarbolates, creasote, hypochlorite of soda, or the hyposulphites under these circumstances. Chlorate of potash should be given freely as a drink. When the nostrils are blocked up, and there is much nasal secretion and discharge, it is well to wash out the meatuses occasionally with weak disinfectant solutions, or a weak solution of nitrate of silver may be required.

If the temperature is *very high, and continues so*, it is necessary to reduce it by means of cold water, in one of the ways described when speaking of "fever."

All adynamic symptoms must be treated by free stimulation, with quinine, or ammonia and bark, camphor, musk, &c. If the patient is very restless, sleepless, or delirious, these symptoms are often much relieved by pouring warm or cold water over the head.

It is impossible to enter into all the complications which may call for special treatment, but a few words must be stated with regard to the renal affection with dropsy. If this comes on, the measures to be adopted are, free dry cupping over the loins (or it may even be advisable to take a little blood from the renal region), followed by hot poultices; the use of the hot air or vapor bath, in order to excite skin action; purgation by means of jalap and cream of tartar; and to drink plentifully of diluent fluids. When the acute symptoms have subsided, some preparation of iron is most valuable, especially the tincture, and also quinine.

For those extremely malignant cases, with early and severe cerebral symptoms, no treatment is of much avail. The use of a hot mustard-bath, or cold water affusion, seems likely to do most good. A blister may be applied to the nape of the neck, and stimulants administered by enemata, but these cases are generally fatal. Belladonna has been stated to be a prophylactic against scarlatina, but this statement has been proved to be wholly without foundation.

CHAPTER V.

RUBEOLA—MORBILLI—MEASLES.

Etiology.—Measles is distinctly infectious, especially when the eruption is out, and its virus passes off abundantly in the exhalations of a patient, the air around being thus contaminated. It is also conveyed by "fomites." Children have taken it from sleeping in a bed or room previously occupied by a patient suffering from measles. Inoculation has been accomplished through the blood and secretions. A second attack very rarely occurs.

Children are most affected, but those only a few months old often escape during an epidemic, and no age is exempt. Epidemics are more liable to occur during cold and damp seasons.

ANATOMICAL CHARACTERS.—The chief of these is the specific eruption, but this often disappears to a great extent after death. It is due to hyperæmia, with some inflammatory exudation, and in some forms minute extravasations of blood occur. More or less bronchitis invariably sets in; but, in fatal cases, it is usually extensive and "capillary," and associated with collapse of the lung, and lobular pneumonia. Laryngitis is not unfrequently present. The blood is dark and fluid in fatal cases.

SYMPTOMS.—I. *Incubation Stage.*—This generally lasts from a week to ten days, but may be less, or sometimes extends to two or three weeks. As a rule, there are no symptoms.

II. *Actual Attack.*—1. *Premonitory Stage.*—The fever usually sets in somewhat suddenly, with chilliness, actual rigors, or occasionally convulsions. Then there are the ordinary symptoms of pyrexia, but not of great severity in the majority of cases, though the temperature rises rapidly to 101° or 102°, and now and then to 104°. The child is languid, irritable, and restless, or may be somewhat delirious at night. Among the most prominent symptoms are those indicative of *catarrh.* The eyes are injected and watery, with a feeling of soreness and sandiness, and a dislike for light, the eyelids being also red and tumefied. There is a constant irritating, watery discharge from the nose, with frequent sneezing, and occasionally epistaxis takes place. A sense of tightness, fulness, or pain is complained of over the frontal sinuses. Some sore throat is generally present, with redness, and the voice is a little husky or hoarse, but these symptoms are not prominent. Bronchial catarrh is indicated by tightness and uneasiness over the chest, with a frequent, dry, hoarse cough, quick breathing, and wheezing, or dry rhonchal sounds, or rhonchal fremitus. A little epigastric pain and tenderness is sometimes present, or general abdominal pains, and there may be much vomiting. The bowels are generally constipated, but may be loose.

2. *Eruptive Stage.*—The "rash" makes its appearance in most cases on the fourth day, but may be seen from the first to the seventh or eighth. It begins usually on the face, especially on

the forehead, then spreads to the trunk, and lastly to the limbs, occurring in these parts in almost distinct crops, on three successive days, but it occasionally is first evident on the limbs. Commencing as small, scattered, red points, these enlarge to the size of a millet-seed or small pea, and become perceptibly raised and "papular," eventually being flattened at the summit. They can be plainly felt, and sometimes feel hard.

The eruption tends to form patches of a crescentic, semilunar, or irregularly circular shape. In some cases it is so abundant as to form extensive, irregular, but well-defined patches, almost uniformly red, but with elevations upon them; in others, it is only sparsely scattered, especially on the limbs, and may be limited to the face and upper part of the chest. The tint is variously described as rose-colored, dark-raspberry, lilac, and yellowish-red. It is more marked and brighter on exposed parts, such as the hands and face. Pressure removes it temporarily, leaving a slight yellowish hue. If the rash is very intense, minute vesicles may form, and small petechiæ are sometimes observed, from extravasations. It goes on increasing for about twelve hours, and then declines in the same order that it appeared, the elevations subsiding, and only a reddish and coppery discoloration remaining, the latter continuing for some time. Slight desquamation of the cuticle occurs in the form of fine, powdery scales, especially on the face and where the eruption has been marked. Rarely does the epithelium separate in patches. Occasionally the eruption suddenly recedes.

During the height of the rash, the face and hands are often somewhat puffy and swollen. There is frequently much itchiness and irritability of the skin.

The *catarrhal symptoms* generally increase during the progress of the eruption to its height. The conjunctivæ and mucous membrane of the nose, mouth, and throat, are more or less inflamed, and various discharges, or even ulcerations, are met with. Deafness occasionally occurs, from the Eustachian tube being involved. The tongue is much furred, usually moist, and presents a few enlarged and red papillæ; it cleans in patches; sometimes it is dry and brown. Vomiting and diarrhœa may be prominent and persistent symptoms.

The chest-symptoms and physical signs indicate the existence of more or less extensive *bronchial catarrh*, the cough becoming moist with muco-purulent expectoration, and rhonchal fremitus with various rhonchal sounds being perceived.

The *temperature* increases up to the height of the rash, especially during the later period, there being, according to Dr. E. Fox, a previous fall before the commencement of the eruptive stage. It does not usually reach above 103°. Morning remissions may be slight, marked, or absent. Defervescence occurs from the fourth to the tenth day, as a rule by a *rapid crisis*, the temperature falling 2°, 3°, 4°, or even 5° in 12 hours. One or two slight evening exacerbations take place, and then the temperature is normal, or falls even below this point for a few days. In rare instances the temperature rises very high, to 108° or 109°. It must be remembered. that it is much influenced by complications.

The *urine* is febrile, with abundant lithates, which are deposited on standing. It has a peculiar odor; not uncommonly there is slight albuminuria, and sometimes blood is passed. The sweat and breath are said to have a peculiar odor. In the majority of cases the various symptoms disappear as the fever subsides, and convalescence sets in more or less rapidly.

VARIETIES. 1. *Morbilli mitiores, vulgares*, or *simplices*.—This is the ordinary form of measles already described. 2. *Sine eruptione*.—Sometimes there is fever and catarrh, but no eruption. 3. *Sine catarrho*.—There may be no catarrh, and occasionally even pyrexia is absent, so that the disease is merely indicated by its eruption. 4. *Graviores* (*malignant*, *black*, or *hemorrhagic*).—This form may be due to epidemic influence, or to the bad health of the patient. It may be at first like ordinary measles, or assume a virulent aspect from the outset. It is characterized by typhoid symptoms, severe nervous disturbance, and irregularities in the eruption. There is great depression and prostration, with a very weak, frequent, and irregular pulse, cold extremities, a dry and brown tongue, and sordes on the teeth and lips. Twitchings, picking at the bed-clothes, convulsions, delirium of a low and muttering character, or stupor, are generally present very early. The eruption comes out only slightly and irregularly, often receding and reappearing. It is distinctly livid, purple, or black, being mixed with abundant petechiæ, especially about the legs; sometimes hemorrhages take place. Extensive bronchitis, pulmonary congestion, or pneumonia, is liable to set in. Death usually occurs from asthenia, coma, or asphyxia.

COMPLICATIONS AND SEQUELÆ. 1. Among the most frequent and important are *affections of the respiratory organs*, which may become dangerous during or subsequent to the attack of measles. These include acute laryngitis, croupous or diphtheritic, chronic laryngitis, *capillary bronchitis*, chronic bronchial catarrh, *lobular collapse*, *pneumonia, catarrhal or broncho-pneumonia*, acute or chronic phthisis, tubercular or non-tubercular, rarely gangrene. Each is indicated by its own special symptoms and signs. 2. Measles not uncommonly leaves behind a general bad state of health. In some cases *acute tuberculosis* seems to be brought into activity by it. 3. Inflammations about the eye, nose, and ear are liable to occur, tending to become chronic, and accompanied with a discharge. 4. The glands of the neck and other parts are often inflamed, and may remain chronically enlarged. 5. Severe diarrhœa is sometimes a grave complication, or occurs as a chronic sequela. 6. Rarely acute Bright's disease is set up with albuminuria and dropsy. 7. In exceptional cases diphtheritic or gangrenous inflammation of the labia has been met with.

DIAGNOSIS.—In the early stage the *catarrhal* symptoms are those which are important in a diagnostic point of view, along with the fever. At this time, however, measles is very like influenza. The eruption may simulate that of scarlatina, roseola, the early stage of small-pox, typhus fever, or syphilitic exanthem. Flea-bites have been mistaken for it.

PROGNOSIS.—As a rule the immediate prognosis is favorable, but the number of deaths varies much in different epidemics. It is worse in old persons, in large towns, and during cold and damp seasons. The chief sources of danger are the lung-complications, and these have to be carefully watched and guarded against. The malignant type is necessarily exceedingly dangerous, and if recovery takes place there is a very slow convalescence. The sequelæ which are liable to occur after measles must be borne in mind when giving a prognosis.

TREATMENT.—Decidedly the principal thing to attend to in the majority of cases is to ward off any dangerous symptoms about the chest. This is best carried out by keeping the patient in bed, in a room at a uniform temperature of from 60° to 65° F., according to the time of the year, where a kettle may be kept boiling. All exposure to draughts must be carefully avoided until the entire course of the fever has been passed through, and the bronchitic symptoms have subsided. The patient must remain quiet, and it is well to darken the room somewhat. Only a slop diet should be given, but it need not be too low. The bowels must be kept regularly open by mild aperients. A mixture containing *liquor ammoniæ acetatis*, *vinum ipecac.*, and a few drops of *tinct. camph. co.*, if the cough is very troublesome, with *camphor mixture*, may be administered. If there is much tightness about the chest, a sinapism, or hot poultices or fomentations should be applied. Thirst is to be alleviated by ice or small quantities of acid drinks. If there is much heat and discomfort about the skin, careful sponging with tepid water may be resorted to, only a limited surface being exposed at the same time. Should the bronchitis become severe, tending to be capillary, it is best treated by giving vin. ipecac. in good doses, avoiding all opiates, encouraging cough, and applying linseed-meal poultices, sinapisms, &c., freely over the chest. Removal of blood is *very rarely* permissible, but, on the contrary, stimulants are often called for, such as ammonia and chloric ether, with wine or brandy, and plenty of liquid nourishment, administered in small quantities at frequent intervals. If signs of suffocation set in, mustard-baths or warm-baths with cold douching, should be employed, as well as artificial respiration. All forms of pneumonia require a stimulant treatment.

Laryngeal symptoms indicate the necessity for applying heat and moisture externally, and the use of inhalations of steam.

Any tendency to the "typhoid" condition must be combated by the free use of stimulants and nourishing food. If the eruption suddenly recedes, it is recommended to try to bring it out again, by means of various baths, and warm drinks internally, but this must be done with caution.

During convalescence it is necessary to exercise care for some time, to guard against colds, and in order to restore the health fully it may be advisable to give quinine and iron, with cod-liver oil, and to recommend change of air to a suitable place as regards climate, with cold bathing, especially with salt water. The clothing must be warm, and flannel should be worn.

The different complications and sequelæ not alluded to are to be treated by the same methods as when they arise from other causes.

HYBRID OF MEASLES AND SCARLATINA—RÖTHELN.

It is necessary briefly to allude to an affection which has been described, in which the characters of measles and scarlatina are more or less combined. At first there is pyrexia, with both catarrhal symptoms and sore-throat, varying in their comparative severity. An eruption comes out on the third or fourth day, and appears simultaneously all over the body, but is less marked on the limbs. It looks at first like that of measles, but quickly forms irregular patches, which are raised, especially at the centre, where the color is of deeper red than towards the circumference. They vary in size from that of a sixpenny-piece to that of a crown-piece. The rash usually fades in four or five days, but may continue for ten days, and is followed by furfuraceous desquamation, beginning at the centre of the patches.

The symptoms increase during the eruptive stage, and may be very intense. Defervescence is usually gradual, but may be by crisis.

CHAPTER VI.

VARIOLA—SMALL-POX.

ETIOLOGY.—The *specific poison* which generates small-pox is very easily conveyed from one person to another by inoculation, contact, and infection. It exists in the blood, in the contents of the vesicular and pustular eruption, as well as in the substance of the dried scabs, and is also given off abundantly in the various secretions, excretions, and exhalations, especially in those of the lungs and skin. Inoculation can be effected through the blood, and very certainly through the serum, pus, or dried scabs of the eruption. Formerly this was resorted to, in order to produce a mild type of the disease. Small-pox is one of the most infectious diseases, and the infection can be carried considerable distances. It is exceedingly dangerous to be in the vicinity of a patient suffering from this disease, even in its mildest form, as this may induce the most virulent type. The poison clings tenaciously to "fomites," especially to clothes and other articles of a rough texture, and retains its vitality for a long period; therefore it is most dangerous to go into a room which has been occupied by a small-pox patient until this has been most thoroughly disinfected, and all clothing, &c., will certainly convey the disease unless treated in the same manner. There can be no doubt but that it has been frequently propagated by cabs. During the past year a considerable number of patients have come under my notice in the out-patient department of University Hospital suffering from mild variola, and as they had been sitting for some time among the other patients, it is not at all improbable that the affection is sometimes produced in this way.

The safer conclusion as regards the time during which infection lasts, is to consider it as beginning with the earliest appearance of symptoms, and continuing for some time after the eruption has disappeared. It is most marked during the period of suppuration. It is very important to bear in mind that the bodies of those who have died from small-pox are undoubtedly infectious. A second attack is only rarely met with, but even a third may occur.

Variola may be met with at any age. It is most common and most severe in those who have either not been vaccinated at all, or only inefficiently. Constitution and race seem to influence its occurrence and characters. Some individuals resist all infection, and cannot even be inoculated. The negro and dark races generally suffer severely. Dread of infection is said to act as a predisposing cause. The lower classes suffer most, for obvious reasons.

ANATOMICAL CHARACTERS.—The eruption is the result of circumscribed inflammation of the skin, extending more or less deeply. There is first congestion, which some believe begins in the follicles of the skin. Then the papillæ enlarge, and the cells of the rete mucosum increase, thus giving rise to papules. A layer of soft, whitish exudation is described as existing between the cuticle and the true skin, which is due to an increase in the cells of the rete mucosum. Next a clear fluid collects beneath the superficial layer of the epidermis, constituting a vesicle, and after this pus forms. The pustules either rupture or dry up. The true skin may be extensively involved and destroyed. Further particulars will be given in the description of the eruption. Mucous surfaces are not uncommonly affected, especially the conjunctiva and mucous membranes of the mouth, throat, and nose. Occasionally the whole extent of the respiratory or alimentary mucous tract is involved. There may be merely inflammation, or it is said the specific eruption may be present. Other mucous surfaces are also affected, and the eruption has been described as occurring on the peritoneum and in organs. Various organs are often inflamed, as well as serous membranes, especially the pleuræ and sanguineous exudations are prone to occur. The heart, kidneys, liver, and muscles generally are soft, and the seat of fatty degeneration. Putrefaction goes on rapidly after death.

SYMPTOMS.—I. *Incubation Stage.*—During this period there may be some feeling of general illness, but no definite symptoms occur. It lasts ordinarily from nine to twelve or fourteen days, but from five days to three weeks have been stated as its extreme limits.

II. *Actual Attack.*—1. *Premonitory or Invasion Stage.*—As a rule it commences suddenly, with chills or repeated and well-marked rigors, followed by pyrexial symptoms, constituting the "primary fever." The temperature rises rapidly, and may reach 104° or 106° before the eruption appears. Along with the usual symptoms of fever, which are generally severe, there are others of a very significant character, viz., a sense of much *uneasiness and fulness in the epigastrium*, or *actual pain*, with *nausea* and more or less obstinate *vomiting;* general pains, but especially *in the middle of the back*, opposite the lower dorsal, lumbar, and sacral regions, this pain not being increased by movement; and *considerable debility and feeling of illness*, with trembling of the muscles. Even in mild cases, it is often remarkable how prominent these symptoms are. Much headache is usually present, with flushing of the face and throbbing of the carotids. In some cases the disease sets in with violent nervous symptoms, such as restlessness, delirium, somnolence, stupor, coma, or convulsions, the last being particularly frequent in children. Occasionally there is considerable sore throat or coryza. The severity of the symptoms at this period is generally in proportion to that of the subsequent stages.

III. *Eruptive Stage.*—The eruption appears during the third or at the beginning of the fourth day. The face is almost invariably its primary seat, especially the forehead, but in rare cases it commences about the wrists. It spreads over the body and limbs in from one to two days, and is described as forming three successive crops. The number of spots or "pocks" varies from just a few to thousands, but as a rule from 100 to 300 are present. On the face they are more abundant than elsewhere. They may be distinct or run together in different ways, giving rise to varieties which will again be alluded to.

Characters and Course of the Eruption.—If a typical individual "pock" be observed it will be found to go through the following course. It starts as a bright-red spot, very small, and a little raised; enlarging, and becoming more elevated, it forms a distinct *papule* on the second or third day, well-defined, flattened at the top, and having a *peculiar, solid, hard, dense feel,* compared to that of a shot or mustard-seed under the skin, which is very characteristic. This soon changes into a *vesicle,* a little clear thin fluid collecting in the centre, under the epidermis. About the fifth day a depression forms on the top of the pock, which becomes *umbilicated;* at the same time the contents gradually become purulent, beginning at the circumference, the central part still for some time remaining vesicular, and this vesicle is stated to be distinctly separated from the surrounding pus by a transverse partition, so that the two portions may be severally emptied of their contents. The pus is formed by softening and liquefaction of a white substance, formed by an increase in the cells of the rete mucosum, which finally become pus-cells. At this time a distinct ring of inflammatory redness appears around each pock. The pus increases in quantity, and after a while the umbilication disappears, the pock becoming either rounded or pointed at the top. Its interior is divided into a variable number of areolæ or compartments, sometimes regularly arranged and of equal size, but usually irregular and unequal, the partitions being formed by the white substance already mentioned. With regard to the cause of the "umbilication," some suppose it to be due to the passage of a gland-duct through the pock; others that it depends on a hair-follicle; while others still describe an organic connection between the epidermis and cutis in the centre, which finally gives way.

About the eighth day of its existence the pustule is at its height, and has arrived at the end of the stage of *maturation*. Then it undergoes retrograde changes. It either ruptures, its contents being discharged, drying up and forming a yellowish-brown scab; or it shrivels and dries up without rupturing. The scab separates from the eleventh to the fourteenth day, leaving a stain of a reddish-brown color, which remains for a variable period. If the cutis is at all destroyed a *pit* is left of greater or less depth, which ultimately becomes of a dead-white color.

The course thus described is liable to variation, from circumstances which will be alluded to presently. It is generally completed on the face before other parts of the body.

The appearances and symptoms associated with the eruption will vary according to its amount. If it is at all considerable there is tumefaction and puffiness of the scalp, face, and neck, as well as of other parts, accompanied with a sensation of throbbing and tightness. The eyelids may be so swollen as to be completely closed. The skin is generally of a deep-red color between the pocks, and feels more or less sore and tender, sometimes very much so. There is usually most uncomfortable itching, which causes patients to scratch themselves, thus producing much soreness and ultimate disfigurement. A characteristic, unpleasant, sickly odor is exhaled from the body.

The eruption not unfrequently occurs on the mucous membrane of the mouth and throat, being accompanied with soreness, salivation, and dysphagia. There is a discharge from the nostrils, or these are blocked up. Sometimes the larynx, trachea, and bronchi are involved, and hence the voice is hoarse, and there is much cough, with more or less dyspnœa. The urino-genital mucous membrane is often affected, causing much pain and soreness, with dysuria and sometimes hæmaturia. It is said that the eruption may even be met with in the rectum, or along the whole course of the alimentary canal, but this is doubtful. Diarrhœa is not an uncommon symptom.

The conjunctiva is often in an irritable and inflamed condition, and hence there is a burning sensation about the eyelids, with inability to bear the light, and increased secretion of tears. Occasionally a pustule forms on the ocular conjunctiva, which may lead to ulceration and destruction of the cornea.

Secondary Fever.—When the eruption appears the *primary fever* abates rapidly, so that the temperature falls nearly or quite to the normal in moderate cases, the patient feeling well. When suppuration begins to take place, however, *secondary fever* sets in, which is *symptomatic*, depending upon the inflammation and suppuration of the skin, being in proportion to this process and subsiding as it subsides. It often begins with rigors or chills. The pulse is frequent, and there is much thirst and dryness of the tongue and mouth. The temperature rises to 104° or 105° F. in a typical case, reaching its maximum when suppuration is at its height, but it may be considerably above this. Defervescence is gradual, and there may be another elevation of temperature when desiccation occurs.

The *urine* is febrile during the existence of pyrexia. Sometimes it contains a little albumen. In bad cases it may contain blood.

VARIETIES.—Several varieties of small-pox are described, which differ greatly in their degree of danger, and which are distinguished by the amount and arrangement of the eruption and by the severity of the other symptoms present. Some of these are due to the disease being modified, as the result of inoculation with the variolous poison, or of vaccination.

1. *Discrete.*—In this variety the pocks are distinct, and do not run into each other, though some of them may touch. They are

never numerous, and may be only a few scattered about. The symptoms are mild as a rule, but depend upon the amount of eruption.

2. *Confluent.*—This is a very serious form, in which the eruption is abundant and the pustules run into each other. The symptoms of the invasion stage are more severe than usual, and marked nervous symptoms are often present. The eruptive stage commences earlier, and there is not at this time such a distinct remission in the fever as occurs in ordinary cases. The eruption is often preceded by erysipelas or erythema. Very numerous papules appear, small, and but slightly prominent, arranged in groups or irregularly, and they rapidly spread over the whole body. The course of the eruption is shorter than usual.

The vesicular and pustular stages are soon reached, the pustules presenting variable appearances. They are often extensive and flat, and large bullæ may be present filled with pus. The face is sometimes "as if covered with one bladder of matter." The contents are in some cases serous and watery, or bloody, and very offensive. Frequently there is no red areola, but the skin generally is of a dark-red color. Extensive crusts form after desiccation, often of a dark color, and soft, which do not separate for some time. Confluence is usually most evident and most dangerous about the scalp, face, and neck; the face may ultimately be covered with a continuous crust, like a mask. The true skin is destroyed more or less, and extensive pits, scars, or seams are left, which tend to contract, and thus great disfigurement results. The eruption is generally considerable on the mucous membranes, giving rise to the various symptoms already mentioned.

Secondary fever does not stand out so distinctly as in the "discrete" variety, and adynamic symptoms are apt to set in, with intense nervous depression.

Complications and sequelæ (to be mentioned presently) are very prone to occur, many of them of a serious nature, and increasing much the danger of the case. Death is an exceedingly common termination in this form, and if recovery takes place convalescence is, as a rule, very slow.

It must be mentioned, however, that cases of confluent small-pox are sometimes met with which run a remarkably favorable course.

3. *Semi-confluent* or *Coherent.*—This is an intermediate variety between the "discrete" and "confluent," in which the pocks are not quite distinct, nor do they actually run into each other. It is not a dangerous form.

4. *Corymbose.*—Here the eruption is arranged in clusters, like bunches of grapes, and it exhibits a tendency to symmetry. It is said to be a very dangerous and fatal variety.

5. *Malignant.*—Under this term several forms which are occasionally observed may be included. In some instances an individual is attacked with severe primary fever, attended with low symptoms, and dies before the eruption can appear, from the intensity of the morbid poison. *Black* or *hemorrhagic, petechial, ulcerative,* and *gangrenous,* are other varieties of malignant small-pox, and the names indicate what they mean.

In the *hemorrhagic* form there is intense adynamia and nervous prostration from the first, with delirium, great restlessness, somnolence, or a tendency to coma. The face is sunken and anxious, and the breathing hurried. The eruption is slow and irregular in its development, sometimes receding; it tends to be livid, or black, hemorrhage occurring into the pustules if these are formed. Petechiæ also occur between the pocks, and hemorrhage takes place from various parts.

6. *Benigna—Verrucosa—Cornea—Horn-pock,* or *Wart-pock.*—This is a mild and abortive form, in which the pocks do not become purulent, but shrivel and dry up on the fifth or sixth day. There is no secondary fever, and the case terminates earlier than usual. It generally follows vaccination. Another mild variety is that in which the eruption continues vesicular (crystalline-pock).

7. *Variola sine Eruptione.*—In addition to those cases in which death happens before the eruption can appear, it is believed that the *primary fever* may occur, without the subsequent appearance of any eruption, in persons well protected.

8. *Anomalæ.*—This term is applied to variola occurring along with other exanthemata, during pregnancy, in the fœtus, &c., and thus presenting irregularities.

There are two modifications of small-pox, which call for special notice.

Inoculated Small-pox.—When the poison of variola is directly introduced by inoculation, the course of events is usually as follows: On the second day a slight discoloration is observed at the seat of inoculation, and on the fourth or fifth day this is somewhat inflamed and irritable, and a small vesicle forms, which enlarges and becomes surrounded by an inflamed areola about the seventh day. From this time to the ninth day the ordinary "primary fever" sets in, and in three or four days more the general eruption appears, the original vesicle having in the meantime become pustular, and being now at its height, after which it undergoes retrograde changes. The important fact in connection with the inoculated disease is, that the whole course of the case tends to be exceedingly mild, the number of pustules being very limited. Occasionally, however, the affection occurs in a serious, or even fatal form.

Small-pox after Vaccination—Varioloid—Varicelloid.—There can be no question as to the fact of variola being prevented, as well as greatly modified when it occurs, by vaccination, if this operation has been properly performed, and if the vaccine-virus is still influencing the system. The mild varieties already mentioned are chiefly due to this. The principal effects of vaccination may be thus stated: 1. It sometimes prevents any eruption, there being merely a slight "primary fever" for three or four days. 2. It diminishes the number of pocks. In some instances there is marked fever, which ushers in very few, it may be a single pock. 3. It modifies and shortens the course of the eruption, and thus diminishes considerably the "secondary fever" and its accompanying dangers, as well as the destructive effects on the skin, with consequent disfigurement. In some instances the eruption, though extensive, does not go beyond the papular or vesicular stage; in others, though it becomes pustular, its course is more rapid, the pustules drying up on the sixth or seventh day. Generally they are small, and do not present umbilication. The unpleasant odor is usually absent. In some cases the eruption is preceded by an erythematous or roseolar rash, and it may appear first on the trunk. As the result of *desiccation* flat, thin, crusts are formed, or hard, shining scales, or occasionally little tubercles. There is either no pitting, or this is very slight.

COMPLICATIONS AND SEQUELÆ.—These are very frequent, especially in connection with the most severe forms of small-pox. The chief of them may be thus arranged. 1. *Affections of the respiratory organs*, viz., low forms of pneumonia, pleurisy, rapid in its progress, and very dangerous, bronchitis, or inflammation of the general respiratory tract of mucous membrane, with the formation of much thick, purulent material, or sometimes œdema glottidis. 2. *Affections of the alimentary canal*, such as severe glossitis, gastritis, enteritis, profuse diarrhœa. 3. *Various local inflammations and abscesses* over parts that are pressed upon, in the subcutaneous cellular tissue, or in the deep structures of the limbs, along with which may be included boils, which often occur in large numbers, and carbuncles. The pus is generally very unhealthy and sanious. 4. Gangrene of certain parts, such as the scrotum or labia. 5. *Erysipelas*, especially of the head and face, ecthyma, rupia, or eczema. 6. *Pyæmia*, or *septicæmia*, from absorption of pus, or septic materials. 7. *Affections of the organs of sense*, which are not uncommonly very destructive, especially ophthalmia, *ulceration of the cornea*, otitis with purulent discharge, ending in caries of the bones, and destructive inflammation of the nose. 8. *Urinary complications, e. g.*, cystitis, retention and subsequent incontinence of urine, renal congestion with albuminuria and casts, or abscess of the kidney. 9. Inflammations of the ovaries or testicles. 10. Various hemorrhages, especially hæmaturia, menorrhagia, hæmoptysis, and epistaxis, accompanied with petechiæ. 11. Peritonitis occasionally occurs.

DIAGNOSIS.—The *pain in the back, epigastric uneasiness*, and *vomiting*, with *high fever* and *marked sense of illness*, constitute the diagnostic symptoms at the early period. Subsequently the course and characters of the eruption are sufficiently distinctive as a rule. Difficulty is sometimes experienced in distinguishing between small-pox and simple febricula, measles, lichen, varicella, and pustular eruption in connection with syphilis. It is only necessary here to point out the differences between variola and varicella. The latter has a very mild primary fever, of brief duration. The eruption appears in about twenty-four hours, and begins about the trunk, being rare on the face; generally one or two large vesicles are seen on the shoulders. They are few in number, scattered about, large, superficial, and ill-defined, without any hardness or inflamed areola, not umbilicated, and they do not become pustular. Their course is over in four or five days.

PROGNOSIS AND MORTALITY.—Small-pox is a very grave disease, the proportion of deaths being exceedingly high, averaging about one in three. Death may take place at any period of the disease, but occurs most frequently from the eighth to the thirteenth day, especially on the eleventh.

The usual *causes of death* are high fever, adynamia, apnœa, pyæmia, or septicæmia, direct loss of blood, or, at a later period, asthenia.

Many circumstances influence the prognosis, viz.: 1. *Age.* Small-pox is very fatal in young children (under 5), and in persons who have passed middle life. From 10 to 15 is the most favorable period. 2. The hygienic conditions surrounding the patient. 3. The previous habits and health of the patient, with the state of the blood and nervous system. 4. Whether satisfactory vaccination has been accomplished or not. 5. The intensity of the ordinary symptoms of small-pox. Among the signs of evil import are recognized a very high temperature, persistent and excessive lumbar pain, severe vomiting after the appearance of the eruption, as well as all symptoms of an adynamic or malignant character, with nervous depression. 6. The amount and characters of the eruption. The gravity of the case is in proportion to the confluence of the eruption, and to the rapidity of its extension. The corymbose variety is very fatal. Other bad signs in connection with the eruption are—imperfect development of the pustules, or their sudden subsidence, lividity, hemorrhage, or gangrene in connection with them; the presence of petechiæ, pallor with absence of swelling between the pustules. 7. The complications present. These influence greatly the prognosis, and aggravate the danger of any individual case, especially those referable to the respiratory organs and nervous system. Hemorrhages are very serious. Convalescence is also much delayed by complications and sequelæ. 8. Pregnancy is a very dangerous condition associated with small-pox. Abortion usually occurs, and the termination is generally fatal. In some cases the eruption is present over the fœtus. 9. Epidemic constitution. Some epidemics are comparatively mild, others very grave.

TREATMENT.—It is impossible not to feel much difficulty in writing about the treatment of such a disease as small-pox, without having had a very extensive experience of it, especially as there seem to be considerable differences of opinion on the subject among those who have enjoyed this experience. Judging from the opportunities for observation which have fallen to my lot, and from what I can gather out of the statements of others, the indications for CURATIVE treatment seem to me to be as follows: 1. To pay *strict attention* to the patient's hygienic conditions, and to diet. 2. To prevent a copious eruption, and to guide this through its different stages as mildly as possible, checking extensive suppuration and destruction of the skin, *especially about the face*. 3. To subdue pyrexia, if this tends to be high. 4. To sustain the strength during the process of suppuration. 5. To treat certain symptoms, which are often prominent and distressing. 6. To guard as much as possible against all complications, and treat them as they arise.

1. In all cases, however slight they may be, it is advisable that small-pox patients should be confined to their rooms. Free ventilation is essential, and the apartment should be large and moderately cool, all carpets and excessive curtains and bed-clothes being removed, care being taken to protect the patient against taking cold, in consequence of unnecessary draughts. *Cleanliness* is also most important, the linen being frequently changed, and at once subjected to the action of some disinfecting agent. In the early period low diet is called for, as a rule, with plenty of cooling drinks, or ice, and fruits, especially roasted apples, while all forms of stimulants must be avoided. Later on it is generally necessary to alter the diet gradually, and to have recourse to beef tea, soups, jellies, &c., as well as to stimulants, of which the nature and quantity required must be judged by each individual case. In all cases of a low type, and especially when there is much suppuration, considerable support is needed, in the way of diet and stimulants, and if there are indications that the patient

will have to struggle through a long process of suppuration, it is important not to allow the strength to be much reduced, but to employ supporting measures carefully from the first.

2. The management of the eruption has always naturally attracted considerable attention. At one time it was the custom to keep the patients very warm and give them hot drinks, with the view of "bringing out the eruption," but at the present day the object is to limit it as much as possible and to modify its course, so as to prevent the dangers of much suppuration and the subsequent pitting and disfigurement. The skin must be sponged freely with lukewarm water to which may be added some antiseptic, such as carbolic acid, Condy's fluid, chlorine water, or sulphurous acid. Recently it has been recommended to apply carbolic acid and oil freely over the surface, but this proceeding is of questionable propriety. Some consider that the eruption is best checked by keeping the patient *in a dark room*, others advocate puncturing each pock as soon as pus forms. Many *local applications* have been made use of in order to prevent *pitting*, the chief of which are nitrate of silver, either applied in the solid form to each pustule or brushed over the surface as a solution; mercurial plaster or ointment; solution of corrosive sublimate (gr. ij ad ℥vi); sulphur ointment; tincture of iodine; gutta-percha dissolved in chloroform, and carbolic acid. Most of these are very irritating, and require much care in their employment. Dr. Sansom strongly advocates touching each pustule with carbolic acid, and then applying a mixture of this substance with oil of thyme. All the pustules should not be touched at one time, but they should be attacked on successive occasions. Mr. Marson recommends waiting until the pustules have discharged, and then applying either olive oil, alone or mixed with lime-water or calamine; a mixture of glycerin and rose-water; or cold cream and oxide of zinc. He warns against allowing the scabs to dry, and to remain for some time on the nose and other parts of the face. Of course the patient must be prevented from scratching. The irritation from the acrid secretions is best relieved by frequent sponging and by the free use of some absorbent powder, such as flour, starch, hair-powder, or calamine. If there is much erup-

tion on the scalp it is necessary at an early period to cut the hair very short, or even to shave the head.

3. Usually the pyrexia is kept within limits by the sponging and by the administration of cooling drinks, with a diaphoretic saline mixture. A brisk purgative is advisable at the outset, and the bowels should be kept freely open afterwards. *Venesection is never called for.* If the fever tends to be very high, large doses of quinine seem to answer best in this disease.

4. During the suppurative stage tonics are needed, and most authorities recommend various remedies of this class, such as quinine, iron, or mineral acids with decoction of bark. If there are low symptoms these must be given freely, with ammonia, camphor, &c., and plenty of nourishing food and stimulants.

5. The chief symptoms which may require to be treated are vomiting, diarrhœa, restlessness and sleepiness, delirium, soreness of the throat, and hemorrhage. The first two must be combated by the ordinary remedies. Morphia answers best for procuring sleep, and it is recommended to be given for one or two nights, in order to get the patient into the habit of sleeping. Care must be taken not to give narcotics if there is much bronchial catarrh or salivation. Delirium is often very troublesome. In most cases, where this symptom exists, the free use of stimulants is indicated, but not always. The chief remedies recommended are morphia or opium, alone or with tartar emetic, if there is great restlessness; bromide of potassium in full doses; chloral; nepenthe in brandy; cold to the head, or the douche; or the application of a leech to each temple. Some advocate physical restraint, and others have seen benefit derived from the use of the warm bath. Sore throat is best relieved by some mild gargle, or by sucking ice frequently, or taking a little currant jelly. Hemorrhages call for the administration of tincture of steel freely, tannic or gallic acid, turpentine, or ergot of rye, separately or in combination. Retention or suppression of urine is said to occur sometimes, but in the Small-pox Hospital it has never been found to give any trouble. The catheter must be used should the urine be retained.

6. The complications are too numerous to enter into their treatment at any length. It is necessary to take every precau-

tion against and to be always on the lookout for them, especially those connected with the respiratory organs and eyes, and abscesses. Inflammations rarely require any removal of blood; occasionally a few leeches may be applied. As a rule, however, a stimulating plan of treatment is indicated. Blisters, mustard-poultices, or linseed-meal poultices are often useful, and also inhalations. When there is bronchitis, the patient must be encouraged to cough frequently. All abscesses must be speedily opened. Purulent discharges require much attention to cleanliness.

There is one class of complications which demands special notice, viz., those connected with the eyes. In order to prevent these it is recommended to apply cold water constantly, or to use compresses of a weak solution of corrosive sublimate (gr. i ad ℥vi). If they occur, supporting treatment is indicated. A blister over the temple often does good if there is much conjunctivitis. Marson recommends the use of poppy-fomentations with alum. It may be necessary to touch an ulcer of the cornea with a pointed stick of nitrate of silver or a solution of this substance. A green shade should be worn.

There is one method of treating small-pox which demands special notice, as it has recently been brought prominently forward and extensively tried. This is the *treatment by antiseptics*. On the whole the balance of opinion seems to be in favor of the internal administration of these remedies, but some have not found them so valuable as others, and there is decidedly no unanimity of opinion as to which antiseptic it is best to use. Different observers advocate the employment of carbolic acid, sulpho-carbolates, sulphurous acid, sulphites, or hyphochlorites. At the same time tonics, such as quinine, iron, &c., may be given.

Another plan of treatment which has lately been advocated is that by *vaccination*, a large quantity of the vaccine-matter being introduced into the system by hypodermic injection. This has been tried at the Small-pox Hospital, and reported to be thoroughly ineffective, or even dangerous.

During convalescence good diet and tonics are required, and cod-liver oil is often very useful. As soon as the patient is in a fit condition warm baths should be employed, carbolic soap being freely used.

Preventive Treatment.—The rules for preventing the spread of contagious diseases should be rigidly carried out in the case of small-pox, and patients who have suffered from this disease must not be allowed to mingle with healthy persons until they are quite recovered and have been thoroughly disinfected. I mention this because in some places it is not uncommon to see persons walking about who are decidedly infectious. The great prophylactic against small-pox, however, is *satisfactory vaccination* and *re-vaccination. Inoculation* with variolous virus, in order to produce a mild type of the disease, is only justifiable under certain rare circumstances, viz., when small-pox breaks out among a lot of people in a confined space, and no vaccine matter can be obtained, *e. g.*, on board ship out at sea.

VACCINIA—COW-POX.

Vaccination is too extensive a subject to be considered at any great length in this work, but it is requisite to draw attention briefly to the chief practical points connected with it.

ETIOLOGY.—*Vaccinia* is an acute specific disease, due to a specific virus. In the cow, especially the milch cow, it occurs as a natural malady, either sporadic or epizootic, running a definite course, and attended with the formation of a vesicular eruption near the udder and on the body of the teats. In the human being it is only produced as the result of inoculation, either from the cow directly, or from one person to another, and it need scarcely be mentioned that this is done in order to protect against small-pox.

Many believe that vaccinia is identical in its nature with variola, only modified by its occurrence in another animal, and there have been many observations and experiments which seem to support this notion.

METHODS OF VACCINATING AND PRECAUTIONS TO BE OBSERVED.—The great majority of practitioners vaccinate with lymph taken from the human being, but some advocate that it should be obtained immediately from the cow. There seems to be positive proof that the lymph does not deteriorate, or lose its protective power, after passing through any number of individuals. The matter should, if possible, be inoculated when fresh, being inserted directly from arm to arm. Often, however, this is not practicable, and the lymph has to be collected in glass tubes, on ivory points, or on little plates of glass, and used subsequently. It has been recommended to mix the lymph in a watch glass with twice its quantity of pure glycerin and water, and preserve it in capillary tubes, when it is said to be equally effective. It should always be taken from a perfectly healthy child, from thoroughly characteristic vesicles, *on the eighth day.* Several punctures are to be made *on the summit* of each vesicle, so that no blood may be mixed with the lymph, and all pressure must be avoided, only such fluid as escapes spontaneously being made use of. If *dried lymph* is employed, it has to be rendered liquid, by mixing it with a very minute quantity of water.

Vaccination ought to be performed when children are very young, *i. e.*, from six weeks to three months old, provided other circumstances are favorable. It is most important that they should be in good health at the time, especially that they are free from skin affections and acute disorders, such as diarrhœa. If small-pox is in the neighborhood, however, vaccination should be performed under any circumstances, and at the earliest age, even immediately after birth, if there is great risk. If children are weakly, and there is no urgency, vaccination may be delayed for a year or two. Of course no age is too late for vaccinating, if it has not been done previously. When vaccination is unsuccessful, it should be repeated in a few months.

The chief methods of performing the operation are as follows: the part selected for the inoculation being the arm, over the insertion of the deltoid muscle, the skin being made tense. In whatever way it is done, it should be performed carefully and thoroughly: 1. By a single or double puncture with a sharp lancet well charged with the lymph, this being introduced obliquely under the cuticle into the cutis, so as to produce a valvular aperture; it is to be left in for a few seconds, and, as it is removed, the seat of puncture must be compressed. Several special instruments have been invented for this operation. 2. By making a number of minute superficial punctures, or "tattooing," and then applying the lymph with the flat surface of the lancet. 3. By first rubbing in the lymph, then tearing up the cuticle with the lancet over a surface equal to about a sixpenny piece, and finally rubbing in more lymph. Two such patches are sufficient. 4. By scratching the cuticle, and thus producing superficial scarification, the lymph being then applied. Some employ single long scratches, distant half an inch to an inch from each other; the best plan, however, is to make a number of fine parallel scratches over a small area, and others may be made across these. Scarifiers have been invented for this purpose, but the ordinary lancet answers very well. 5. By abrasion of the cuticle with the edge of the lancet, used as an "eraser is used to remove blots from paper." 6. By vesication, liquor ammoniæ being applied, and then the cuticle rubbed off, and the vaccine matter applied.

Where the surface over which vaccination is performed is small, as in the case of puncture or limited scarification, it is necessary to inoculate in at least *five points* in the same arm, at distances of about half an inch apart, or in three places on each arm.

Revived lymph may either be inserted directly, by means of the lancet, or, if it is on ivory points, these may be inserted into punctures, or rubbed on scarified surfaces.

PHENOMENA FOLLOWING VACCINATION.—At the end of the second or beginning of the third day, little papular elevations are visible over the points of inoculation, with slight redness around. The elevation and redness increase, and by the fifth or sixth day, distinct vesicles form. These are round or oval, bluish-white, raised at the margin, and depressed in the centre. At the close of the seventh, or beginning of the eighth day, a circular inflamed areola forms around each vesicle. The latter continues to enlarge until the eighth day, when it is in its most perfect state, being full, tense, rounded, and much raised at the margin, and presenting a pearly color and lustre, with translucency. The contents appear clear and slightly viscid, but different observers have described minute, active particles, which are visible under high powers of the microscope, and which are supposed by Dr. Beale to be particles of bioplasm, to which the lymph owes its active properties.

The areola continues to extend for a couple of days, reaching a diameter of one to three inches, and being accompanied with more or less induration and swelling; sometimes small vesicles form upon it. On the tenth or eleventh day it begins to fade, and at the same time the vesicle dries in the centre and becomes brown there, its contents becoming opaque and drying up, so that by the fourteenth or fifteenth day a hard, reddish-brown scab is formed. This darkens in color, shrivels, and falls off from the twenty-first to the twenty-fifth day, leaving a permanent scar. A typical cicatrix ought to be circular, white, not less than one-third of an inch in diameter, depressed, with minute pits or foveolæ over the base. Sometimes there are radiations from the centre.

The appearances and course above described may be modified by certain obvious circumstances, or without any evident cause. After some of the methods of vaccination the vesicles are compound, or in crops. In adults they do not usually present thoroughly typical characters, on account of the structure of the skin, while their course is often retarded, and the areola is diffuse. Retardation or acceleration of the course is sometimes seen, without any evident reason for this. In some cases an entirely irregular and spurious form of eruption occurs. This is generally due to improper lymph having been used, to the child being in an unhealthy condition, or to mechanical irritation, but occasionally it cannot be explained.

Many irregularities are observed when the lymph is taken immediately from the cow. "Papulation is deferred till the seventh, eighth, ninth, or tenth day, and the areola is not complete till from the eleventh to the fourteenth or sixteenth day, being also harder, and it is said to revive and decline, continuing to exhibit a brick-red or purplish hue while the hardness remains. The vesicles are usually not more developed than those produced by ordinary lymph. Desiccation is prolonged, and the crust is often retained till the fourth or fifth week."

Certain local and constitutional symptoms usually accompany the development of the vaccine vesicles. There is itching, heat, tension, and pain in the arm when maturation occurs, with a feeling of stiffness, and difficulty of movement. Occasionally erythema or erysipelas occurs, or the vesicles may ulcerate or slough. The glands in the axilla are often enlarged and tender, especially in adults. There is no primary fever, but a symptomatic fever occurs at the time of maturation, during which it is said the temperature may reach 104° (Niemeyer). At this time the child is fretful and restless, and the alimentary canal is often deranged. Rarely severe symptoms are met with, which may prove dangerous, especially in weakly children. A general rash is sometimes observed, of a roseolar, lichenous, or vesicular character, which does not usually last beyond a week. These eruptions are more common after vaccination direct from the cow.

REVACCINATION.—This is often required, in consequence of the primary vaccination having been imperfect or insufficient, as indicated by deficient number, or non-typical characters of the cicatrices. But even when the original vaccination has been in every way satisfactory, it is desirable to revaccinate after puberty. Some recommend that the operation should be performed every seven years, but this appears quite unnecessary, and one good revaccination may be considered as affording perfect protection. The same precautions and care are required as in the case of primary vaccination.

Results of Revaccination.—In some cases there is no effect, especially in children. On the other hand, now and then, a perfectly typical course is observed, most commonly in adults. Usually the course and characters of the eruption are much modified. It appears earlier, reaches its height by the fifth or sixth day, being either papular, or in the form of an acuminated vesicle, with an indurated, diffused, and irregular areola. A small scab forms by the eighth day, which soon falls off. There is generally much local irritation, and constitutional symptoms are, as a rule, much more marked than in primary vaccination. Erysipelas is liable to occur, and occasionally fatal pyæmia sets in. I have known a patient sink rapidly after revaccination, without any obvious cause.

REMOTE EFFECTS OF VACCINATION.—There cannot be the slightest doubt in the mind of any unprejudiced observer, with regard to the powerfully protective influence of vaccination against the ravages of small-pox. In a large proportion of cases, if vaccination has been *thoroughly and efficiently* performed, and especially after revaccination, there is *absolute and complete protection.* But even when it is not entirely prevented the disease occurs only in a slight and modified form, is scarcely attended with any danger, and does not leave behind the hideous disfigurement which it produces if unchecked. Epidemics have been much less frequent and severe since the introduction of vaccination, and this result has been in proportion to the efficiency of the measures which have been put in force to insure general and successful vaccination. This has been observed in every part of the world, and among all races. It is very important to bear in mind that in proportion to the number and typical characters of the vaccination marks, will be its protective power against small-pox.

Statistics have also been collected to prove that vaccination exercises a protective influence against scrofula, phthisis, and continued fevers, especially typhoid, as the mortality from these affections has diminished since its introduction. It may be questioned, however, how far this is correct, seeing that there have been other influences at work, which might more directly account for this improvement.

On the other hand certain affections have been stated to be transmitted by vaccination, especially cutaneous diseases, scrofula, and syphilis. The balance of evidence is strongly against this statement, still cases have been brought forward, especially those recently mentioned by Mr. Hutchinson, which indicate that such a result might possibly happen, and to guard against the mere possibility of this evil it is necessary to pay strict attention to the precautions already alluded to, and especially to see that the lymph is taken from a perfectly healthy child.

TREATMENT.—All that is generally required is to protect the arm from irritation, and prevent the vesicle from being scratched. If there is much subsequent inflammation, wet lint, lead lotion, or poultices may be applied.

During the fever it is well to keep the child indoors. Unusual complication, such as erysipelas, may call for special treatment.

VARICELLA—CHICKEN-POX.

This affection has been supposed to be merely a modified form of variola, but the evidence is conclusive that they are perfectly distinct diseases.

ETIOLOGY.—Varicella is decidedly contagious, and may be transmitted either by direct contact or by infection. It is doubtful whether it can be inoculated, but probably not. Occasionally it occurs as an epidemic. A second attack is never met with. Varicella is only observed in children as a rule, but now and then affects adult females.

SYMPTOMS.—1. *Premonitory* or *Invasion Stage.*—After an *incubation period*, which has been variously stated as lasting from four to fifteen or seventeen days, there is slight pyrexia, with headache and sometimes cough, having a duration of from twenty-four to thirty-six hours, when the eruption appears. In many cases there are no symptoms at all during this stage.

2. *Eruptive Stage.*—As already stated, the eruption comes out within twenty-four or thirty-six hours, at first there being but a few spots, but fresh crops appear during four or five nights in considerable numbers. They are quite distinct as a rule, but a few may be confluent sometimes. They are first seen usually about and between the shoulders and over the chest, but may occur on any part of the body. The scalp is often affected, but the face rarely, and only slightly. Some authors have described the eruption as being vesicular from the first. As a rule, however, it begins as bright-red spots, slightly papular, not at all hard, and disappearing on pressure. They are merely due to hyperæmia, there being no exudation. Within a few hours they become vesicular, a clear fluid collecting under the epidermis. The vesicles are of good size, round or oval, ill-defined, not umbilicated or divided into spaces, so that when punctured they collapse completely. There is no inflammatory areola. The appearance is sometimes "as if the patient had been subjected to a shower of scalding water." In about twenty-four hours the contents of the vesicles become slightly and uniformly opalescent, and a faint red areola appears. The vesicles either rupture or dry up from the

third to the fifth day, a small scab extending from the centre to the margin. This is generally thin and crumbly, coming away in particles, but occasionally a thick, coherent crust is formed. A faint, peculiar smell is said to attend the eruption. Usually no discoloration or pitting remains, but in rare instances distinct pits are left, which are round or elliptical, smooth and shining. The only subjective sensation is that of itchiness, which may be considerable.

The *general symptoms* are very slight as a rule, there being only a little feverishness. Sometimes there are rather severe exacerbations of fever during the night. Catarrh is frequently present, and may be dangerous. In some cases the patient remains in a bad state of health for some time after convalescence.

A number of *varieties* have been described, but they are of no importance, and most of them are really modifications of small-pox.

DIAGNOSIS.—Varicella may be mistaken for variola; the points of difference have already been alluded to.

PROGNOSIS.—Death never occurs as the result of varicella.

TREATMENT.—Nothing is required but to keep the patient quiet; give mild diet, and see that the bowels are free. Children must be prevented from scratching themselves. If catarrh is present this must be attended to; and if there is much fever salines may be useful. Quinine may be given during convalescence.

CHAPTER VII.

ERYSIPELAS—THE ROSE—ST. ANTHONY'S FIRE.

ETIOLOGY.—It is only proposed to treat here of that form of erysipelas which occurs as an *acute*, *idiopathic* disease, the *traumatic* varieties being described in surgical works. By the majority it is regarded as an *acute specific disease*, and is believed to be infectious, but some do not recognize its contagious nature. There can be no doubt, however, that it is capable of transmission from one individual to another, especially in hospitals, and it sometimes occurs as an epidemic. The poison is given off into the atmosphere, and may be conveyed by fomites. It has also been inoculated. Frequently no obvious *exciting cause* can be made out. Among those mentioned are exposure to direct cold or heat; general exposure to cold and wet; very slight injury; irritation of bad teeth; errors in diet, especially the use of shellfish, &c.; and violent mental emotion.

There are some very important *predisposing causes*, viz.: 1. *Age.*—Newly-born infants, and persons from twenty to forty, are most subject to acute erysipelas. 2. *Sex.*—It is said to be somewhat more frequent in women, especially during menstruation. 3. *Individual* and *family* predisposition are frequently observed, and those who have suffered once are very liable to subsequent attacks. 4. *State of the System.*—Plethora, debilitating diseases, gout, renal disease, the presence of dropsy, and any low febrile condition, as well as that produced by intemperance, are the chief predisposing causes coming under this head. 5. *Season.*—Erysipelas is most common during the warmer months.

There is reason to believe that erysipelas may, by infection, give rise to certain allied diseases, such as puerperal fever.

ANATOMICAL CHARACTERS.—Erysipelas is characterized by a *diffuse inflammation* of the skin, which generally also involves the subcutaneous cellular tissue, and may extend to the deeper structures. At first there is hyperæmic redness, varying in tint, followed by more or less vesication and by serous infiltration of the areolar tissue, which causes much swelling. In severe cases pus may form under the cuticle, in the subcutaneous tissue, or in the deep tissues. There is no tendency to the formation of lymph, so that the inflammatory process is not limited by adhesions, and any pus formed is liable to be of a low type. Occasionally ulceration or gangrene ultimately happens, especially when the tissues affected are in a low state of vitality, as when dropsy is present. The appearances will be described more fully when considering the symptomatology.

The lymphatic glands and vessels are always affected, and the veins leading from the erysipelatous part are also inflamed in many cases and may contain pus.

In fatal cases the blood is often dark and liquid, and does not coagulate firmly. Congestion is observed in the different organs, especially in the lungs, and sometimes signs of inflammation are present. The small vessels of the lungs and head frequently contain pus. Little emboli, composed of white corpuscles or albuminoid masses, have been found in the small vessels of the gray matter of the brain by Bastian and others.

The mucous and serous surfaces may be the seat of erysipelatous inflammation.

SYMPTOMS.—Some *premonitory* symptoms, of a general character, as a rule usher in an attack of erysipelas, but not invariably. There is a feeling of illness, with general uneasiness or muscular pains, disturbance of the digestive organs, sore throat, headache, restlessness, and other signs of nervous disorder, with a certain degree of pyrexia. Some shivering or chilliness may be felt at the outset, but usually no marked rigors take place until the local inflammation is about being or has been developed. These symptoms may last from a few hours to four or five days before the characteristic appearances of erysipelas set in, but generally the latter are evident within two or three days. Epistaxis occasionally occurs at the outset.

The *local signs* of erysipelas are as follows: At first there is a feeling of heat, irritation, and tightness, the skin is tender to the touch, and stings or smarts. Soon the part affected becomes red, swollen, hard, tense, and shining, at the same time all the painful sensations being aggravated and there being increased thermometric heat. Sometimes the swelling precedes the redness.

The inflammation starts from one spot and generally extends chiefly in some particular direction, but sometimes spreads in all directions equally. There is a well-marked boundary-line between the *advancing* inflammation and the healthy skin, as shown by the difference in color and by the abrupt termination of the swelling, but there is only a gradual transition at that border where it is subsiding.

The hue of the redness varies, but it tends to become darker as the case advances. The swelling is much greater where abundant, loose cellular tissue exists, and is then often irregular in form and consistence, and pits on pressure. In structures whic are dense, unyielding, and closely attached, such as those of th scalp, the sensations are far more painful than in lax tissues.

In slight cases the symptoms subside and only desquamatio occurs; as a rule, however, vesicles of various sizes form on th surface of the skin, containing a yellowish serum, and in ba cases large, irregular bullæ or bladders are produced. The burst and discharge their contents, often leaving crusts which on separating, may disclose superficial ulceration. The cuticl always peels off extensively. Occasionally signs of more or le suppuration, ulceration, or moist gangrene are observed, an these processes may lead to great destruction of tissue.

The *seat* and *extent* of the inflammation varies in different case Idiopathic erysipelas is most common about the head and fac and it generally begins about the nose, ear, angle of the mouth lower eyelid, or cheek. Dr. Reynolds has observed that it usually starts at the point where the skin is undergoing transitio into a mucous membrane. It tends to spread rapidly, so tha soon the whole face, scalp, and neck may be affected, and ther is very great swelling, the features being obliterated, the eyeli closed, the nostrils blocked up, and deafness is often complaine of. Not unfrequently abscesses form, especially in the cheeks o eyelids. The erysipelas is prone to extend to the mouth an fauces, and may even reach the larynx, producing serious symptoms; occasionally meningitis occurs by extension.

In some cases the limbs are affected, especially the legs, an now and then the trunk. I have recently had under my car two cases of erysipelas, involving the whole of both legs, complicating acute rheumatism. Some local irritation may determin the locality of an erysipelatous inflammation.

The *time* taken by erysipelatous inflammation in running it course varies, but the redness and swelling generally attain thei height on the second or third day. Different parts of the surfac are seen in different stages of advancement. After it has apparently stopped the inflammation may again spread, and *relaps* not uncommonly occur. In some cases it is *erratic* or wanderin in its progress, and may be *metastatic*.

Usually the absorbent glands and vessels in the neighborhoo show signs of irritation, being enlarged, painful, and tender, sometimes very much so, and they may be affected first. Suppuration rarely occurs.

The *general symptoms* usually increase with the onset of the local inflammation. Ordinarily there is merely more or less pyrexia. The *pulse* rises to 100 or 120, and is full and strong. The *temperature* rises rapidly at the outset, and may attain a height of 104° or 105° on the first evening of the eruption. Usually the maximum is reached on the third day, but it increases so long as the skin affection advances, and may get up to 106° or 108°. As a rule there are distinct evening exacerbations, but the evening temperature may be 2°, 4°, or even 5° lower than that of the morning (Reynolds). *Defervescence* sets in in favorable cases about the fifth or sixth day of the eruption, and the temperature rapidly falls, becoming normal in from twelve to thirty-six hours. In some cases, however, it remains high for a much longer time, and defervescence is less critical. These observations apply chiefly to *facial erysipelas*, for great deviations are met with when it attacks other parts. Any *relapse*, or extension of inflammation is indicated by an increase in temperature, which may be *noticed before there are any external signs*. Complications will also influence the temperature.

In *facial erysipelas* there is considerable restlessness, and in many cases the mind wanders, or actual delirium occurs, especially at night, without there being any cerebral complication. The *tongue* always tends to become dry and brownish, and in all cases of a low type it assumes distinctly adynamic characters, with sordes on the lips and teeth, the *pulse* becoming very rapid and feeble, and other typhoid symptoms also setting in. This is likewise apt to occur in persons who are very weak, in those who have been intemperate, and in the aged.

The *urine* is febrile. Urea is increased, and chlorides diminished. Albumen is frequently present.

Complications are sometimes present, viz., cerebral and spinal meningitis, bronchitis, intestinal catarrh, and renal congestion or inflammation. As already mentioned, the erysipelas may spread to the throat or larynx, and may attack serous membranes.

VARIETIES.—Several varieties of erysipelas are described, form and consistence, and pits on pressure. In structures which are dense, unyielding, and closely attached, such as those of the scalp, the sensations are far more painful than in lax tissues.

In slight cases the symptoms subside and only desquamation occurs; as a rule, however, vesicles of various sizes form on the surface of the skin, containing a yellowish serum, and in bad cases large, irregular bullæ or bladders are produced. These burst and discharge their contents, often leaving crusts which, on separating, may disclose superficial ulceration. The cuticle always peels off extensively. Occasionally signs of more or less suppuration, ulceration, or moist gangrene are observed, and these processes may lead to great destruction of tissue.

The *seat* and *extent* of the inflammation varies in different cases. Idiopathic erysipelas is most common about the head and face, and it generally begins about the nose, ear, angle of the mouth, lower eyelid, or cheek. Dr. Reynolds has observed that it usually starts at the point where the skin is undergoing transition into a mucous membrane. It tends to spread rapidly, so that soon the whole face, scalp, and neck may be affected, and there is very great swelling, the features being obliterated, the eyelids closed, the nostrils blocked up, and deafness is often complained of. Not unfrequently abscesses form, especially in the cheeks or eyelids. The erysipelas is prone to extend to the mouth and fauces, and may even reach the larynx, producing serious symptoms; occasionally meningitis occurs by extension.

In some cases the limbs are affected, especially the legs, and now and then the trunk. I have recently had under my care two cases of erysipelas, involving the whole of both legs, complicating acute rheumatism. Some local irritation may determine the locality of an erysipelatous inflammation.

The *time* taken by erysipelatous inflammation in running its course varies, but the redness and swelling generally attain their height on the second or third day. Different parts of the surface are seen in different stages of advancement. After it has apparently stopped the inflammation may again spread, and *relapses* not uncommonly occur. In some cases it is *erratic* or wandering in its progress, and may be *metastatic*.

Usually the absorbent glands and vessels in the neighborhood show signs of irritation, being enlarged, painful, and tender, sometimes very much so, and they may be affected first. Suppuration rarely occurs.

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The *urine* is febrile. Urea is increased, and chlorides diminished. Albumen is frequently present.

Complications are sometimes present, viz., cerebral and spinal meningitis, bronchitis, intestinal catarrh, and renal congestion or inflammation. As already mentioned, the erysipelas may spread to the throat or larynx, and may attack serous membranes.

VARIETIES.—Several varieties of erysipelas are described,

CHAPTER VIII.

DIPHTHERIA.

ETIOLOGY.—*The ordinary exciting cause* of diphtheria is a *specific poison*, and the disease is highly infectious and contagious. It not unfrequently occurs in severe epidemics. The contagion is believed by some to exist only or principally in the peculiar deposit which forms on the throat and other parts, but it unquestionably exists in the breath, and probably in other exhalations and secretions. It may spread through a house, but there is always more danger of infection in the case of those who are brought into close contact with the patient and inhale the breath, or have the morbid products coughed out upon them. After convalescence a patient may infect another individual for an uncertain time. The disease is more liable to spread if there is much secretion from the nose, &c., especially if cleanliness is not attended to. The poison clings tenaciously to houses and rooms for a considerable period. It is a matter of doubt whether diphtheria can be produced by inoculation with the deposit.

Some believe there is a form of this disease, not due to contagion, but produced by bad hygienic conditions, especially by drainage emanations. I have certainly observed some cases which seem to bear out this idea.

The *predisposing causes* are the period of childhood, *individual and family susceptibility*, bodily fatigue or exhaustion, and nervous excitability. Anti-hygienic conditions do not seem to increase the frequency of the contagious form. Hot and dry climates and seasons appear to favor the development of the poison-germs.

ANATOMICAL CHARACTERS.—A peculiar inflammation of the fauces, attended with the deposit of patches of exudation, is the usual local manifestation of diphtheria. At first there is *redness*, which may begin in any part, with *swelling*, and an increased amount of viscid mucus. The redness spreads over the whole of the mucous membrane of the throat, and then the patches of lymph are observed. The deposit may commence in any part, and start from one or several points. It extends, so that it often covers the entire surface, or the patches may remain distinct, having a variable thickness. The *characters* of the lymph vary much. The *color* may be gray, white, or slightly yellowish; *consistence* ranges "from cream to wash-leather." On removing the substance, which can be done more or less readily, a raw, bleeding surface is left, or sometimes a distinct ulcer, which is again speedily covered by fresh deposit, the exudation taking place into as well as upon the mucous membrane, thus causing its superficial destruction. The under surface of a patch presents sometimes little spots of blood. There is occasionally considerable ulceration or sloughing of the soft palate, uvula, or tonsils, or abscesses may form.

The deposit may spread from the throat to the mouth, lips, nose, larynx, trachea, bronchi (even to their finest ramifications), or rarely to the œsophagus, stomach, intestines, and gall-bladder. Occasionally it begins *primarily* in some of these parts. Any raw surface is very liable to be affected.

Microscopically the material consists chiefly of epithelial and granular cells, with granules of fat and protein. Sometimes fibres are present and disintegrated tissues. Vegetable growths have been observed, but not always. *Chemically* it resembles fibrin.

The *lymphatic glands* in the neighborhood are enlarged and inflamed, especially those near the angles of the jaw. If much ulceration or gangrene exists there is general swelling of the neck, owing to infiltration of the tissues with serum or lymph.

In fatal cases the various organs are found much congested. The spleen and lymphatic glands generally are enlarged. The lungs are the seat of acute insufflation, collapse, or lobar or lobular pneumonia, in many cases, and sometimes of apoplexy. The kidneys may show signs of parenchymatous inflammation. Fibrinous coagula are frequently observed in the cavities of the heart, extending into the great vessels.

SYMPTOMS.—Diphtheria is essentially a general disease, with local lesions. Hence it is usually ushered in by some general or constitutional symptoms, followed by the ordinary local symptoms of affections of the throat, as well as by others, referable to the different parts which may become involved. At the same time there is an increase in the general disturbance, which may become extremely severe, and the disease is liable to be followed by a peculiar nervous disorder. The *invasion* is usually gradual, there being a feeling of illness and languor, more or less weakness and depression, often with chilliness, anorexia, nausea, diarrhœa, headache, drowsiness, or other symptoms, with some pyrexia. At the same time there may be some stiffness of the neck, tenderness about the angles of the jaw, or slight sore throat.

The symptoms of the developed disease vary considerably in character and severity, and hence Sir W. Jenner has arranged the cases into groups, which, however, are not absolutely distinct, but often run into each other.

1. *Mild Form.*—Here there are slight throat symptoms, and, on examination, some signs of inflammation and exudation are seen. A little tenderness and swelling of the glands about the angles of the jaw are present. Pyrexia is mild and of short duration. The urine is *not albuminous*, and no sequelæ follow the attack. Occasionally extensive deposit on the throat is observed, without any particular general symptoms. Although the temperature may be high, recovery is rapid and complete. Such a case came under my care recently, and there was no evidence that it was due to contagion, nor did the disease spread to others.

2. *Inflammatory Form.*—Premonitory symptoms occur, followed by the ordinary signs of pyrexia in a marked degree, the patient feeling very ill and weak. The *pulse* soon tends to become feeble. At the same time there are severe throat symptoms, viz., pain, difficult and painful deglutition, alteration of the voice, &c., and, on examination, signs of inflammation are seen, followed by the deposit of exudation in from twelve to forty-eight hours, which possesses some consistence and toughness. This may be coughed up in pieces of variable size. The disease may spread to the larynx, and produce violent laryngeal symptoms and serious interference with respiration. The glands of the neck are much enlarged.

The *urine*, in addition to being febrile, contains often much albumen as well as some granular casts.

3. *Insidious Form.*—Without any particular general disturb-

ance, and only slight sore throat, laryngeal symptoms suddenly come on with severity, and may lead to speedy suffocation.

4. *Nasal Form.*—There is at first a sanious discharge from the nose, with low fever. Soon the throat is seen to be red and swollen, and fluid also escapes through the posterior nares, while the glands about the angle of the jaw swell. Afterwards the ordinary deposit may form on the pharynx or larynx, the latter being sometimes unexpectedly attacked, or the symptoms may subside.

5. *Primary Laryngeal Form.*—This is distinguished by the disease starting in the larynx and spreading to the pharynx. Laryngeal symptoms are therefore prominent from the first.

6. *Asthenic Form.*—This is characterized by general symptoms of a low type. They may be present from the first, or are preceded by the usual symptoms, more or less severe. The sense of illness and prostration becomes very great; the complexion is dirty-looking and opaque, and the skin generally may assume a dirty yellowish tint, and has a peculiar feverish pungency, though the temperature is not high. The *pulse* tends to be very frequent, small, weak, and irregular, and the heart's action is greatly lowered. The *tongue* becomes dry and brown, and sordes form on the lips and teeth. Ultimately the ordinary "typhoid" symptoms set in, and the patient sinks.

In this variety there may or may not be much deposit over the throat or larynx, but it is of the soft, pulpy kind, and hence the local symptoms are often not proportionately severe. It is in these cases that extensive ulceration and sloughing are chiefly met with, and, as a result, the breath is very fetid, and the decomposing matters are liable to be absorbed into the blood. There is also great swelling about the neck.

COMPLICATIONS AND SEQUELÆ.—*Albuminuria* is a very frequent occurrence in diphtheria, and the quantity of albumen is sometimes extreme. Fibrinous casts may be present at the same time, and also more or less blood. These conditions may be associated with a marked change in the *kidneys*, especially in the epithelium of the tubes, but the relation of this to the general disease is not determined.

Other complications met with are acute distension of the lungs, the vesicles sometimes giving way; collapse; lobar or lobular pneumonia; and pulmonary apoplexy. These particularly occur if the respiratory passages are involved.

A very remarkable series of *sequelæ* are liable to arise, referable to derangement of the nervous system. They may occur after the mildest attack, but are more frequent and more marked in severe cases as a rule. Generally a period of apparent convalescence intervenes, the duration of which varies from a few days to some weeks, but the symptoms appear in most cases within three weeks. They are usually indicative of *paralysis*, motor or sensory, and are either localized, or may extend progressively, so as to affect the whole body.

The *pharyngeal muscles* often suffer. The voice becomes snuffling or inarticulate; deglutition is difficult, and fluids are apt to pass into the nares, while solids produce a choking sensation, with violent, irregular action of the muscles. At the same time *anæsthesia* of the mucous membrane exists. The *tongue, lips, and cheeks* may become involved. *Vision* is apt to become suddenly impaired from paralysis of the ciliary muscle, the power of adjusting the eye being lost; at the same time the iris is affected, and there may be squinting. The limbs are then apt to be attacked, beginning with tingling and numbness in the fingers and toes, with impairment of touch, which spreads upwards, power at the same time becoming diminished, so that at last there is no control over the movements, and patients cannot stand. After a time the muscles waste and become flabby. The *head* sometimes rolls from side to side, owing to paralysis of its supporting muscles. The bladder may be involved, and constipation sometimes exists, owing to the abdominal muscles being affected. In some cases great danger arises from the *respiratory muscles* being attacked, so that breathing cannot be carried on.

The *heart* is liable to be affected, its beats becoming very infrequent, sometimes as low as 16 per minute, slow and weak, until finally the organ ceases to act at all. Serious symptoms accompany this condition.

Abnormal sensations are often complained of in various parts, as well as *hyperæsthesia* and *tenderness*.

The *duration* of these symptoms varies much, as well as their *intensity* and *extent*. Usually the termination is favorable, provided the respiratory muscles and heart are not involved.

DIAGNOSIS.—Diphtheria may simulate any acute throat affection. It has chiefly to be distinguished from *scarlatina*, *croup*, *herpes on the pharynx*, and *extensive thrush*. Careful examination of the throat generally enables us to come to a decision, combined with the general symptoms. In *herpes* the vesicles may be seen, which cannot be removed; there is much more severe, but limited pain; and the same condition exists on the lips.

DURATION AND TERMINATIONS.—The duration of the *specific disease* is from two to fourteen days, but its complications and sequelæ may prolong it greatly. *Death* is a very frequent event, especially in some epidemics. It occurs from—1. *Apnœa*, due to laryngeal affection, which is most frequent in children, and usually occurs in the first week. 2. *Asthenia* or *septicæmia*, most common after puberty, and takes place after the first week. 3. *Uræmia*. 4. *Secondary nervous disturbance*. This is very fatal in children, but death does not happen after two months.

PROGNOSIS.—Always grave; the prognosis is worse in children than adults. The chief signs of danger are—implication of the larynx; great discharge from the nares; epistaxis; repeated vomiting or diarrhœa; a very rapid and feeble pulse, or a *very infrequent pulse;* symptoms of adynamia, especially with delirium; signs of uræmia; the presence of albumen, blood, or casts in the urine, especially if abundant; a sudden rise in temperature. Even *mild cases* may prove fatal from asthenia, or the nervous sequelæ may come on and cause death.

TREATMENT.—The management of cases of diphtheria must depend very much on their type and intensity. It is always advisable for the patient to stay in bed, even in the mildest cases; and hygienic conditions must be observed, the room being kept at a good, uniform temperature.

In slight attacks it is sufficient to open the bowels; give some saline mixture, with a diet of beef tea and milk; and employ soothing local remedies, viz., warm poultices or fomentations over the throat, steam inhalations, and some mild gargle.

In a severe case it is important that the air of the room should be maintained at a temperature of 65° to 68°, and be kept moist with steam, by allowing a kettle with a long spout to be continually boiling, or by boiling water in an open vessel over a spirit-lamp. Children should have a tent made over their cribs, by curtains or blankets, and the steam be made to pass within this. Some saline drink may be given, or one containing chlorate of potash, the latter being decidedly useful. The most valuable medicine, however, that we possess for this, as well as for many other affections, is *tincture of steel*, which should be given in full doses every two or three hours. It may be combined with quinine.

Local treatment is of essential importance. At first the measures already mentioned may be carried out, but when exudation is formed, more energetic treatment is indicated to prevent its extension. Some recommend the *repeated application* of solution of caustic, of dilute acid, or of tincture of steel and glycerin; but it is certainly better to follow the plan advocated by Sir W. Jenner, viz., *of making one thorough and efficient application*, around as well as over the patches. He advises that a solution of caustic (℈i to ℥i of water) should be used, being painted on with a brush. The surface around the exudation may be touched with the solid nitrate of silver. He also recommends the use of equal parts of hydrochloric acid and water in the same way. Tincture of iron, or equal parts of liquor ferri perchloridi and glycerin, have likewise been employed with the view of preventing extension. It is but right to add that some excellent authorities deprecate the use of any of these severe applications.

Gargles are valuable if the patient is old enough to use them. One containing tincture of iron and glycerin is recommended; or chlorate of potash may be used freely. Other methods of local application are very serviceable in children, and also in adults. The brush may be used, or a spray-inhaler; or powders may be blown in through a straw. Trousseau employs a mixture of alum and sugar in this way; others use tannin. It is important *not to tear off the membranous patches.* If gangrene or ulceration sets in, solid caustic must be freely applied, and antiseptic gargles frequently employed, such as one containing carbolic acid, Condy's fluid, or hypochlorite of soda. When there is discharge from the nose, this should be frequently washed out by antiseptic injections through the nostrils. It may be necessary to apply local remedies in the neighborhood of the posterior nares from the throat.

There has been much difference of opinion as to the treatment which should be adopted, when the larynx is involved. If there is evidence of considerable obstruction to the breathing, and if the exudation is increasing, the only possible thing to do is to perform *tracheotomy* or *laryngotomy*, the former in children, the latter in adults. Sir W. Jenner urges that the trachea should be opened as high up as possible, and recommends that the edges of the wound be touched with caustic. The greatest precautions must be taken after the operation to prevent inflammation of the respiratory organs. The results of the operation are almost always temporary relief, and prolongation of life; ultimately the issue is very frequently fatal, still cases do recover sometimes, when apparently almost hopeless, of which I have seen some conspicuous instances.

It is well to give a tolerably nutritious diet from the first, including plenty of milk. Ice and cool drinks should be taken frequently. If there are any signs of depression considerable nutriment is called for. Alcoholic stimulants are not required at the outset in most cases, but these must also be given as soon as there is any indication that the powers of the system are failing. They are often needed in large quantities in adynamic cases, and children bear them well. In these cases also other stimulants should be given, such as ammonia with bark, camphor, musk, and ethers.

It is scarcely necessary to mention that every precaution must be taken against the disease spreading by infection.

For the nervous sequelæ the best remedies are quinine and iron, or strychnine, with a supporting and nutritious diet, including stimulants. Blistering the nape of the neck is sometimes useful. Galvanism may be employed in connection with paralyzed parts.

CHAPTER IX.

GLANDERS AND FARCY—EQUINIA.

ETIOLOGY.—These affections, which are occasionally observed in man, are derived from the horse, ass, or mule. It is doubtful whether they are distinct diseases, or varieties of the same. They are produced by the inoculation or contact of a *specific poison*, which is contained chiefly in certain discharges, but also in the excretions, secretions, and blood; and they usually occur in those whose occupation brings them much into contact with horses, viz., hostlers, grooms, &c. Glanders may be produced at some little distance off, in consequence of a horse snorting, and thus expelling a quantity of the discharge from the nostrils into the surrounding air, from which it is afterwards inhaled. The poison may be conveyed by fomites, to which the discharges become attached. It is even said glanders may arise from breathing the atmosphere of a stable containing glandered horses. These diseases can be retransmitted to the horse, and also to the ass, as has been proved experimentally, and there is reason to believe that they are capable of being communicated from man to man.

PATHOLOGY AND ANATOMICAL CHARACTERS.—Glanders and farcy constitute a specific disease, having a *period of incubation*, followed by certain peculiar morbid changes. Hard nodules form in the mucous membrane of the nose, mouth, throat, and respiratory passages, lymphatic glands, skin, subcutaneous tissue, muscles, lungs, and other organs. These are made up of cells, the result of proliferation, which soon degenerate, the nodules becoming soft, breaking down, and forming abscesses and ulcers. The Schneiderian membrane is inflamed, and presents little pustular elevations, or patches, which finally form excavated ulcers, and may lead to necrosis of the cartilages and bones, with perforation of the septum.

Petechiæ, ecchymoses, and gangrene are sometimes observed. The frontal sinuses may contain a puriform fluid. The larynx, trachea, and bronchi are also frequently similarly affected. The *lungs* present pneumonic patches, or purulent formations. Small yellow elevations may be seen on the pleuræ and fibrinous deposits underneath. The lymphatic glands are enlarged, softened, and reddish. Suppuration or gangrene is also observed in the subcutaneous tissue, and in the substance of the muscles. A peculiar eruption occurs on the skin. Farcy differs from glanders in the nasal mucous membrane not being affected, but tubercles, buds, or tumors form in connection with the skin, which break down and produce deep, unhealthy ulcers, or the lymphatic system may be chiefly involved.

The appearances differ considerably, according as the disease is acute or chronic.

Symptoms.—It will be necessary briefly to consider glanders and farcy separately, in their acute and chronic forms.

Acute Glanders.—The *period of incubation* is usually from three to eight days. If due to inoculation local signs of inflammation appear first, as a rule, the lymphatics being also affected. In other cases the disease is ushered in by constitutional disturbance. The patient complains of rigors, languor, pains in the limbs and joints, headache, often vomiting and diarrhœa, and some pyrexia exists. At first acute or subacute rheumatism may be simulated, as was well exemplified in a case which has recently occurred at University Hospital. Soon subcutaneous formations occur, especially on the face, and near the joints, quickly changing into abscesses, containing unhealthy and fetid pus. Over these the skin becomes red or violet, and sometimes limited gangrene sets in. Usually a *peculiar cutaneous eruption* appears, especially on the cheeks, arms, and thighs. It begins as small, intensely red spots, which soon become papular, and then pustular. The pustules vary much in size and number, are flattened or acuminated, and often have a red areola. Sometimes the contents become sanguineous, and dry up into small blackish-brown crusts. This eruption is not due to any exudation under the cuticle, but to circumscribed destruction of the true skin. Dark bullæ often form also on the face, trunk, fingers or toes, and organs of generation, followed by gangrene.

Erysipelatous inflammation of the nose, eyes, and surrounding parts, is not uncommonly observed, which may extend to the scalp.

The eruption is preceded and accompanied by profuse, fetid sweats.

A prominent symptom is *a discharge from the nose*, at first thin and scanty, but soon abundant, purulent, viscid, extremely fetid, and often sanious. It clogs the nostrils, and obstructs breathing, and by escaping through the posterior nares, causes much distress and irritation. A thick matter also escapes from between the eyelids, and sometimes from the mouth, which is then the seat of ulceration and pustules.

The submaxillary lymphatic glands may be enlarged.

The *constitutional symptoms* increase. Prostration is very great, the *tongue* becomes brown and dry, the *pulse* very rapid, feeble, and irregular. Diarrhœa and tympanitis are often present, the stools being exceedingly fetid, and sometimes bloody. Dyspnœa, rapid breathing, hard cough with little expectoration, weak voice, and foul breath, are the symptoms usually observed, referable to the respiratory organs. Delirium and coma ultimately set in, followed by death, which in most cases takes place at the end of the second or beginning of the third week, but may be much earlier or later than this.

Chronic glanders is very rare, and is usually a sequel of farcy. Its chief symptoms are lassitude and articular pains, followed by sore throat, disagreeable or painful sensations in the nose, with more or less puriform and bloody discharge, cough with expectoration, dyspnœa, and altered voice. After a time ulcerations may be observed on the mucous membrane of the nose, with caries or perforation. The pharynx may be ulcerated. There is no eruption.

The general symptoms are less marked than in the acute form, but the latter may set in. The duration varies greatly.

Acute Farcy.—The great difference between this affection and glanders is, that there is no implication of the nares. In one class of cases the eruption is present; in the other set, there is no eruption, but merely inflammation of the lymphatic glands and vessels, with soft tumors under the skin (*farcy buttons* and *farcy buds*). The former are by far the more serious.

Chronic Farcy.—Constitutional symptoms occur at first, followed by the subcutaneous tumors, which form abscesses, and these discharge their contents, leaving foul, deep, and indolent ulcers. As a consequence, there is wasting and great debility. The case may end in glanders, or death may occur from exhaustion, or pyæmia. Occasionally recovery takes place. The duration is very variable.

An affection, termed *equinia mitis*, is described, produced by contagion from horses suffering from "the *grease*." There is fever, depression, with shivering, and a pustular eruption, which dries up into scabs, and these fall off, leaving distinct scars.

DIAGNOSIS.—All that can be said here is, that care should be taken not to confound glanders with acute rheumatism in the early stage. In any patient whose occupation exposes him to contagion, the possibility of the symptoms being premonitory of glanders should be borne in mind. There may be *local signs* to aid the diagnosis. Prostration is more marked than in rheumatism, and the joints are not often swollen or red.

PROGNOSIS in all these affections is very grave. *Chronic farcy* may terminate in recovery.

TREATMENT.—The most important thing is to exercise all precautions *to prevent these diseases.* If inoculation should happen, the spot must be immediately destroyed by some escharotic. A supporting, stimulating, and tonic treatment is the only one that offers any chance of success should either of these affections be present, with attention to cleanliness, opening abscesses, &c. Antiseptics might be of use.

DENGUE—DANDY FEVER—BREAKBONE FEVER.

ETIOLOGY.—Dengue is a peculiar fever, which occurs in an epidemic form, and rapidly attacks a great number of people, the great majority of the population becoming affected. It is not met with in this country, but has occurred in America, the East and West Indies, &c. It is not known what the actual cause is; some believe it is contagious, but the evidence is insufficient.

SYMPTOMS.—After an incubation-period of from twenty-four hours to ten days the attack is usually somewhat sudden, the symptoms being chilliness, a sense of debility and uneasiness, with violent pains in the muscles of the limbs and back, and in a variable number of the joints, which are somewhat swollen. There is also headache, and the alimentary canal is often disturbed, but the tongue remains clean. At first the symptoms very much resemble those of rheumatism. Soon there is fever, and sometimes a rash or papular eruption appears. The lymphatic glands and testicles may be painful and enlarged. In from twelve hours to three or four days the symptoms subside, but debility remains, with some painful sensations. After an interval of two, three, or four days, the fever and pains return, or severe headache sets in. The tongue becomes much furred, and there is considerable epigastric uneasiness, with nausea. An eruption appears on the fifth, sixth, or seventh day, especially on the upper part of the body, which presents very variable characters, resembling that of scarlatina or measles, or being papular, vesicular, pustular, furunculous, erysipelatous, or petechial. As it disappears a scaly desquamation sometimes takes place. It is attended with itching and tingling.

The symptoms present very different degrees of intensity, and they may become of an asthenic character. Almost all cases recover, the average duration being about eight days, but stiffness and soreness, with debility, may remain for some time, and sometimes several relapses occur.

TREATMENT.—Emetics are recommended at the outset, and free purgation. The patient must remain in bed. A saline diaphoretic mixture may be given, and opium is to be freely administered for the relief of pain. If required, the surface may be sponged, and cold applied to the head to relieve headache. The diet must be regulated, and if there is any depression, stimulants and nourishing food should be given. Quinine and mineral acids are recommended during the remission and during convalescence.

PESTIS—PLAGUE.

ETIOLOGY.—This disease is of a specific nature, and generally occurs in epidemics, but sporadic cases are also met with. Formerly it was met with in Europe, but at the present time its chief seats are Egypt, Syria, Asia Minor, and the coast of Barbary. It is undoubtedly contagious, but may arise without this from some "epidemic influence." The chief *predisposing causes* are—overcrowding and bad ventilation; want of cleanliness, with accumulation of filth; insufficient and unwholesome food; debility from any cause; warm, moist air, with residence on marshy soil, or in the neighborhood of certain rivers. Epidemics often follow famine, and are generally preceded by a sickly, oppressive, warm, and moist season.

ANATOMICAL CHARACTERS.—As in other malignant fevers, the blood is dark, and remains fluid or coagulates imperfectly, while it rapidly putrefies. The organs are greatly congested and softened, especially the spleen; also the mucous and serous membranes, which may present petechiæ and ecchymoses. The serous cavities contain excess of effusion. The absorbent glands generally are swollen, dark, softened, or disintegrated. Buboes and carbuncles are generally present.

SYMPTOMS.—Plague is characterized by fever, generally of a low type, with the local development of buboes, carbuncles, and petechiæ. The onset is, as a rule, sudden, and the severity of the constitutional symptoms varies considerably, from a slight fever to one of the most virulent kind. At first there are the usual premonitory signs, viz., rigors, restlessness, feeling of debility and languor, headache and giddiness, nausea or vomiting, and precordial oppression or uneasiness. The expression is heavy and stupid, and the eyes look muddy or suffused. Soon the temperature rises, while prostration increases, with a tendency to syncope. The *pulse* is frequent, but weak or irregular. The tongue is thickly furred, and tends to become dry and brown or black, with sordes. Vomiting, sometimes of black matters, great thirst, and diarrhœa with offensive stools are also present. Respiration is hurried, and the breath is very foul. The urine is much diminished, and may contain blood. Hemorrhages from mucous membranes are not uncommon. Nervous symptoms are generally present, such as delirium, stupor, coma, or convulsions. Death may take place before the appearance of any local signs.

Buboes occur chiefly in the glands of the groin, but are also seen in the axilla, and about the angles of the jaws. They appear at various periods, and are preceded by darting pains. Generally they form abscesses, which discharge and heal slowly, leaving permanent scars.

Carbuncles are seen most on the limbs, but may be on any part. They vary in number and size, and are prone to become gangrenous, sometimes causing great destruction of tissues.

Petechiæ, *vibices*, and *livid patches* occur only in bad cases, and there may be extravasations of blood in the subcutaneous tissue.

TREATMENT.—Attention to all hygienic measures is necessary. The bowels should be freely opened. Some recommend an emetic at the outset. Nutritious food, stimulants, mineral acids, and such remedies, would seem to afford the best results. Probably those who advocate the use of antiseptics, would give them largely in this disease. Cold affusions or sponging may be employed. Poultices are necessary for the buboes and carbuncles, with antiseptic dressings afterwards.

CHAPTER X.

YELLOW FEVER.

ETIOLOGY.—It is by no means agreed upon by those who have had opportunities for observation of cases of yellow fever, whether it is due to malaria, or whether it is a specific disease propagated by contagion. Most authorities maintain the latter view, holding that the *true* fever is of the *continued type*, but that it may be simulated by some malarial fevers of a remittent character. There appears to be strong evidence to prove that the disease may be conveyed by infection, and it has thus originated in seaport towns, in this and other countries, owing to vessels having arrived with cases on board. Fomites may be the means of propagating it.

In certain regions yellow fever is endemic, and it occurs also in severe epidemics. Its principal seats are the West Indian Islands, the seaports of North and South America, the south coast of Spain, Mexico, and the West Coast of Africa. As a rule it requires a temperature of at least 72° F., and is rarely met with at an altitude of more than from 2000 to 3000 feet above the level of the sea.

Among the chief *external predisposing causes* are—a long-continued high temperature; a swampy, or low-lying and crowded district; filthiness, and other anti-hygienic conditions. Individual predispositions also exist. The disease is more liable to occur in children, males, the white races, and in those who have recently come into an infected district. Intemperance and other excesses, fatigue, exposure to night air and dews, render persons more liable to be attacked.

ANATOMICAL CHARACTERS.—The body may be emaciated or not. The skin is of a deep yellow color, and much congested in dependent and distant parts. The tissues generally are softened and flabby. More or less congestion of organs is observed, with sometimes extravasations of blood, and effusions into serous cavities. Softening of the heart, with molecular degeneration of its fibres, is usually met with, and the blood coagulates imperfectly, though soft clots are generally found in the cardiac cavities.

The *stomach* presents morbid changes most frequently. It often contains more or less "black vomit," or blood undergoing alteration. Sometimes a black or bloody mucus sticks to the lining membrane. Signs of congestion or inflammation are present in most cases. Signs of inflammation have been described in connection with the membranes of the cord and the sympathetic system.

SYMPTOMS.—Different epidemics present variations as to the prominent symptoms which are observed, and the cases exhibit all grades, from a very mild form of the disease, to one of a most malignant type. Usually three stages may be recognized in the course of an individual case, following a *period of incubation*, which ranges from one to fifteen days.

1. *Invasion Stage.*—The attack may be preceded by some of the usual premonitory symptoms, or may come on quite suddenly. Chills generally occur at the outset, but are not always observed in tropical climates. These alternate with a sense of heat, and soon there is marked pyrexia, the degree of this being in proportion to the previous chills, and presenting some morning remission.

The pulse is frequent, and in most cases full and strong. The face is flushed, the eyes red and suffused, and the expression anxious and distressed. The skin is hot, dry, and harsh. The tongue is covered with a white fur, moist, red at the tip and edges with enlarged papillæ. Sore throat may be present, and there is a constant desire for cool drinks or ice. Gastric symptoms may exist from the first, but as a rule only become prominent in from twelve to twenty-four hours. Then the patient complains of oppression, uneasiness, weight, or burning pain in the epigastrium, with considerable tenderness; nausea, violent vomiting, and retching are also present, or, after a while, the stomach rejects everything without any effort. The vomited matters may be bilious, or contain streaks of blood, or chocolate-colored flocculi. Obstinate constipation usually exists, with unhealthy stools, deficient in bile. Sometimes there is much flatulence.

Nervous symptoms are the most distressing in the majority of cases. Severe *frontal headache*, with shooting pains in the temples and eyes, are complained of from the first. The most prominent complaint, however, in most instances, is of *pains in the lumbar region and limbs*, which are generally among the earliest symptoms, and often become so intense as to elicit screams and groans, and to make the patient writhe in agony. As this stage advances the patient becomes very restless, and the mind is confused, or wild, violent delirium may set in, with hallucinations. Occasionally there is more or less stupor.

The urine is deficient, and dark in color; it usually contains albumen.

This stage lasts for from a few hours to two or three days usually, but may extend to four or five days. It is longer in the milder cases.

2. *Stage of Remission.*—A marked improvement is observed at the close of the first stage, which in most cases is only temporary, but sometimes is permanent, convalescence setting in, preceded by critical discharges. The symptoms subside more or less completely, the patient feeling comparatively comfortable, and often hopeful, occasionally appearing to be quite well. But at this time there are often some unfavorable signs, viz., greater tenderness in the epigastrium, a yellowish tinge of the skin and urine,

a slow pulse, and sometimes heaviness or stupor. The duration of this remission is usually but a few hours, but may be twenty-four hours.

3. *Stage of Collapse, or Secondary Fever.*—In most cases signs of collapse appear. There is great prostration and debility, which is evidenced in the features. The skin assumes generally a *yellow, orange,* or *bronzed* hue, but not invariably. This spreads from the forehead downwards, and is due to the coloring matter of the blood. The circulation is impeded, the pulse becoming very rapid, weak, and irregular, and capillary congestion or stagnation is observed in dependent and distant parts, with sometimes petechiæ and vibices; at the same time the heart may be beating violently. In bad cases hemorrhages take place, especially from the mucous surfaces. The tongue tends to become dry, brown, or black, or it is smooth, red, and fissured; at the same time sordes may form on the lips and teeth. The gastric symptoms return, and become very intense. "Black vomit" also sets in by degrees, the black color being probably due to altered blood. It is often preceded by "white vomit." The black vomit is not always present, and varies in its exact characters, sometimes pure blood being discharged. Similar matters may pass off in the stools. The urine is often more or less suppressed, and contains albumen; it is sometimes retained. The patient is frequently in a state of apathy and gloomy indifference. As the case progresses, collapse becomes extreme, with a cold, clammy skin, slow, sighing respiration, and hiccough. Consciousness may be retained to the last, or low delirium or coma may set in, with convulsions at the close.

In some cases the symptoms indicate the presence of secondary fever instead of collapse, of variable intensity. It either ends in convalescence, or sinks into the typhoid type, which proves fatal.

As already stated, great differences are observed in the intensity of the symptoms, and also in the nature of those which are most prominent in different cases. Some patients are prostrated at once, and die very speedily. Death usually occurs on the fourth, fifth, or sixth day, but may take place much earlier, or as late as the ninth or eleventh day, or even much later.

The cases have been arranged into certain groups, viz., 1. Algid.

2. Sthenic. 3. Hemorrhagic. 4. Petechial. 5. Typhous. These terms imply the prominent characters peculiar to each variety.

DIAGNOSIS.—The chief matter in diagnosis is to distinguish yellow fever from malarial remittent fever. In both there may be a yellow skin and black vomit. The points of distinction are these: Yellow fever is contagious, has only one paroxysm, and is not periodic; a second attack is very rare; it cannot exist at a temperature at which malarial fevers are often prevalent; hemorrhages and albuminuria are very frequent, the latter almost invariable; quinine has not the influence over it which it exerts in the case of malarial fever.

PROGNOSIS.—Yellow fever is always a terrible disease, but the mortality varies much in different epidemics. It has also been observed that many apparently hopeless cases recover, while others which seem to be mild prove speedily fatal; hence the prognosis is very uncertain. A concise list of favorable and unfavorable signs is given by Dr. Macdonald in "Reynolds's System of Medicine," vol. i, page 492.

TREATMENT.—Attention to all hygienic measures and rules of health, is most important. At the outset hot drinks and warm foot-baths have been recommended, also emetics and purgatives. Large doses of calomel used to be given, but have been proved to be injurious. The same is true of large doses of quinine.

It is important to get the excreting organs to act freely at an early period. Copious enemata are useful, containing turpentine. Saline drinks may be given abundantly. The skin should be sponged, or the wet sheet may be used if the patient is very hot.

Liquid food should be given in small quantities, with cool drinks, ice, &c. Alcoholic stimulants, well diluted, are also valuable. Champagne is very beneficial. Various symptoms require attention, but especially *vomiting*. For this lime-water and milk, hydrocyanic acid, creasote, chlorodyne, and chloroform are the remedies which have been recommended. Great care must be exercised in giving opium or morphia, especially if there is any tendency to suppression of urine. Chlorodyne is suggested as a substitute to procure sleep, relieve pain, &c., hot applications, mustard poultices, being also applied externally to give ease.

Hemorrhages, collapse, and typhoid symptoms must be treated as they arise. During convalescence quinine may be given.

MALARIAL OR PALUDAL FEVERS.

CHAPTER XI.

ON MALARIA, OR MARSH-MIASM.

Before entering upon the consideration of malarial fevers, it is advisable to indicate the main facts pertaining to their *exciting cause*, viz., the malarial or marsh poison.

1. *Origin, Propagation, and Modifying Influences.*—The essential conditions for the production of the malarial poison are—vegetable decomposition, a certain temperature, with a certain degree of moisture. Without the first of these, it cannot possibly arise. Very rarely do malarial diseases occur under a temperature of 60° F., and the heat must be of some duration. As this rises they become more prevalent and more severe. There must not be too much moisture, else the poison is absorbed by it, and it is not formed if the atmosphere is dry.

The necessary conditions are met with chiefly under the following circumstances: 1. In almost all marshes and low swamps, unless they are *peaty, or constantly overflowed with water.* 2. Where there is much vegetable matter in the soils of valleys and ravines, in alluvial deposits, along the banks of tropical rivers, in old estuaries, deltas of rivers, &c. 3. Where surfaces covered with much vegetation have been temporarily overflowed. 4. During the draining of lakes, ponds, &c. 5. In sandy plains containing organic matter, if there is a subsoil of clay or marl, conditions often existing simultaneously in old river courses. 6. In certain hard rocks, especially if they are disintegrating, provided they contain vegetable matters; also in *turning up the soil* in the early cultivation of land, digging canals, &c. 7. Where copious vegetation has been cleared away in dense jungles for purposes of cultivation, leaving sufficient to decompose. It frequently happens that the first result of attempts at cultivation of a new district is the production of malarial diseases, but ultimately they disappear.

Certain circumstances influence the occurrence and propagation of malarial affections: 1. *Season.* Usually they are most prevalent towards the latter part of summer, and in the autumn. They are particularly liable to occur after long-continued dry and hot weather, followed by warm rains. In climates where the *summer is short*, though very hot, they are not prevalent. 2. *Water.* Abundance of water is a protection against malarial affections, because it absorbs the poison. Hence they are temporarily diminished by long and heavy rains and floods. Any deep water, especially running water, gives some protection, and thus the intervention of a river may prevent the poison from passing to the opposite bank. A ship at a little distance from shore is in comparative safety. Some believe sea-water is peculiarly protective. 3. *Winds.* These frequently convey the malaria for a considerable distance, and may thus be the means of originating the diseases in places remote from a malarial district, also counteracting the good effects of the intervention of water, &c. On the other hand, a storm may disperse the poison altogether. 4. *Low districts* are more dangerous than those which are elevated, the malaria tending to cling to the fogs near the earth. The lower rooms of houses are also worse than the upper. 5. *Trees.* When in larger numbers these afford decided protection, but in some cases they seem to be injurious. Certain trees are said to exert a specially protective influence; but this is doubtful. 6. *Mountains and hills* interfere considerably with the propagation of the poison. 7. *Time of the day.* Morning and evening dews augment the danger materially, probably from condensing the poison. It is particularly dangerous to *sleep in tents at night* in malarial districts. 8. *The air of cities* in some way renders the poison innocuous, as, though a malarial disease may be raging outside, it does not penetrate far into their interior. 9. *Artificial heat* destroys malaria, if sufficiently intense. 10. *Individual susceptibility* is increased by certain circumstances, viz., recent arrival in a malarial district, fatigue and exhaustion from any cause, exposure to the full heat of the sun, sudden changes of temperature and chills of all kinds, intemperance, exposure on an empty stomach or overfeeding, mental fatigue, and overcrowding. Some persons are far more susceptible than others. Young children and old persons are least subject, and males are said to be more predisposed than females. White races suffer more than blacks.

2. *Nature.*—Much doubt exists as to the nature of the malarial poison. It has been supposed to be a gas, resulting from vegetable decomposition, but this idea is probably not correct. The most favored view is, that it is organic, consisting either of microscopic plants or their spores, or animalcules. It has been suggested that there are different kinds of paludal poisons, but there is no proof of this. When animal matters are mixed with the decomposing vegetable matters, the poison which escapes seems to be more virulent.

3. *Mode of Entrance into the System, and Effects Produced.*—The poison is chiefly inhaled, and is absorbed by the pulmonary membrane. It may also be taken up by the stomach, which it disturbs greatly at the outset, and possibly by the skin. It acts on the nervous system, and produces fevers of an intermittent and remittent type, with, after a time, permanent organic mischief, especially in the liver and spleen, and also various neuralgiæ. Certain other diseases are attributed to it, such as dysentery, diarrhœa, gastric disturbance, &c., and also a general state of ill-health

and low cachexia, with ultimate degeneration of the race. Malaria imparts a peculiar periodicity to the affections which it originates, as well as to others, and once they have existed, they are liable to occur on subsequent occasions, independently of the action of the original exciting cause, sometimes, indeed, appearing to arise spontaneously.

4. *Preventive Treatment.*—The precautions to be taken may be gathered from what has been already stated, and they may be summed up as the avoidance of everything that increases the individual tendency to malarial diseases, and the making use of every means of protection, so far as is possible, in arranging a place of residence, &c. It has been recommended to give bark daily, and garlic has also been used as a preventive.

INTERMITTENT FEVER—AGUE.

This is the malarial fever which occurs in this country, and is usually prevalent in low, marshy districts. Cases are also met with here, in which the complaint has originated in foreign climates. Its *etiology* is that of paludal fevers generally, and it is important to bear in mind that once the disease has existed, subsequent attacks may arise without any exposure to malarial influence.

ANATOMICAL CHARACTERS.—The *spleen* presents the most notable changes, being at the early period much enlarged from congestion, softened, and sometimes pulpy. This enlargement may be made out during life. After a while it becomes permanently large, hypertrophied, and firm. The *liver* is also congested and soft, and ultimately hypertrophied; albuminoid disease has been stated to be produced occasionally. The *stomach* and *duodenum* are congested, and, in some cases, ulcers have been observed. Chronic Bright's disease is stated to be set up sometimes by ague. In those who have lived long in malarial districts, black pigment is often found in the spleen, liver, and kidneys. The blood is unhealthy, and may contain black pigment.

SYMPTOMS.—Ague consists of paroxysms of fever, running through certain definite stages, occurring at more or less regular intervals, with intermediate periods of complete apyrexia.

Mode of Invasion.—As a rule there are the ordinary symptoms premonitory of fever for some days before the disease declares itself, the pyrexia presenting well-marked remissions, with a periodic tendency. Sometimes the attack is sudden.

Description of a Paroxysm or "Fit" of Ague.—In each paroxysm there are three distinct stages, named *the cold, the hot,* and *the sweating.*

1. *Cold Stage.*—Ordinarily a fit is preceded by general uneasiness and languor, inaptitude for any exertion, headache, loss of appetite, &c. Soon the patient feels cold, first in the limbs, then along the back and over the body. The teeth begin to chatter, and finally the entire frame shivers. At the same time, the skin appears generally pale and shrunken, especially that of the face, the features being pinched and sharp. The tips of the fingers and lips look blue, and, in bad cases, the whole surface assumes a purplish hue. Cutis anserina is frequently observed. The patient often complains of pains in the back and limbs, and headache. The tongue is usually pale, moist, clean, and cool; appetite is lost, but thirst often exists. Nausea and vomiting are not uncommon, with epigastric uneasiness and sense of weight.

Dyspnœa is felt, and breathing is hurried. Dry cough is often present, and the expired air is cool. The pulse is usually frequent and small, and may be irregular. The temperature and state of the urine will be considered separately.

The *intensity* of this stage varies greatly. There may be signs of severe depression and collapse, with a tendency to stupor or coma. Its *duration* is from a few minutes to three, four, or five hours.

2. *Hot Stage.*—The transition to this stage may be sudden, but is generally gradual, there being alternate flushings and chilliness, or partial warmth. When fully developed the skin feels burningly hot and dry, is red and tumid, and sometimes a rash appears in patches. The face is flushed, and the eyes injected and sparkling. There is intense thirst, with dryness and heat of mouth; total anorexia; a white tongue; and sometimes nausea or vomiting. The heart and great arteries throb, and the pulse is generally frequent, strong, and full. Respiration is more quiet than in the first stage. Headache is always present, with a sense of throbbing, and sometimes more or less delirium, which may be very violent, or convulsions.

This stage lasts usually from three to eight hours, the extremes being from two to eighteen hours.

3. *Sweating Stage.*—Perspiration begins about the forehead, and then spreads over the whole body. Its amount varies, but is generally considerable, so that the bed-clothes are saturated, and sometimes the bedding. It continues to flow for some time, during which the pyrexia is reduced, and the symptoms rapidly abate; the patient usually soon falls asleep, and awakes well, or comparatively well. Critical discharges in the urine occur, and not unfrequently diarrhœa. Anasarca has been observed when sweating is deficient.

Condition of the Patient in the Intervals.—At first a person suffering from ague may feel convalescent during the period intervening between the paroxysms; but soon there is more or less languor and depression, with pallor, neuralgic pains, and loss of appetite. After a while permanent organic mischief is established, especially in connection with the spleen, and this leads to serious symptoms, which will be described when treating of splenic diseases.

Temperature.—The course of this is quite characteristic, and may be summed up as *a rapid ascent; short and intense stationary period, and critical defervescence*, constituting the paroxysm; with *a perfectly normal temperature* in the intervals. There is a rise as soon as, or even before, the cold stage begins; at first it is only slight and gradual, but soon becomes rapid, continuing during the hot stage, and sometimes into the commencement of the sweating stage. The temperature generally reaches 105° to 107°, and may go up to 108°, 110°, or even 112° in hot climates. When sweating begins there is generally a slight alternate rise and fall at first, but soon a steady fall sets in, of 2° or more every five to fifteen minutes, until the temperature becomes normal. It is important to notice that even before the paroxysms are experienced, and after they have apparently ceased, the temperature has been observed to rise at the usual periods.

Urine.—During the cold and hot stages water is increased, but it diminishes at the close of the latter, and is very deficient while sweating is going on, and hence the specific gravity rises. *Urea* suddenly increases in amount, as soon as the rise in temperature begins, and this continues until the sweating stage sets in, when it rapidly or gradually diminishes. A relation is said to exist between the amount of urea discharged and the temperature. *Uric acid* is also considerably in excess, and urates are generally deposited at the close of the fit. Chloride of sodium is greatly increased, and phosphates are much diminished. Albumen, blood, or casts, are not unfrequently present in the urine.

In the intervals the state of the urine varies much. Urea is deficient as a rule.

TYPES AND VARIETIES.—The chief types are those founded upon the length of the interval between the paroxysms, viz.: 1. *Quotidian*, in which there is a daily paroxysm, with an interval of twenty-four hours. 2. *Tertian*, where a fit occurs every other day, the interval being forty-eight hours. 3. *Quartan*, a paroxysm taking place every third day, the interval being seventy-two hours. These are the usual types, but exceptionally the following are met with: 4. *Double quotidian*. 5. *Double tertian*, a seizure occurring every day, but at different hours, or with different characters. 6. *Double quartan*, out of three days two having each a paroxysm, the third none. 7. *Duplicated tertian*, there being two paroxysms one day, none the next. 8. *Erratic* or *irregular*. Other very rare types are described.

The *quotidian* has the longest paroxysm; this is said to occur earlier in the day, and to have the shortest cold stage, and the longest hot stage. In the *quartan* variety the conditions are just the opposite, the *tertian* being intermediate. Sometimes the fits tend to begin earlier each day, or later, and thus ultimately one type may be changed into another, or the change may take place suddenly.

Some peculiarities are observed in the paroxysm. Occasionally one or more of the stages may be wanting. The phenomena are in rare instances limited to certain parts of the body; thus in paralyzed patients they may only be seen in the non-paralyzed parts.

Certain forms of ague are also described, according to the symptoms present, viz.: 1. *Sthenic*. 2. *Asthenic*. 3. *Pernicious* or *malignant*, the last approaching the remittent type, and only occurring in hot climates.

TREATMENT.—1. *During the Paroxysm*. In the *cold stage* the patient should remain in bed, well covered with blankets, some form of dry heat being applied externally, and hot drinks administered.

In this country nothing further is necessary, as a rule. When there is much depression diffusible stimulants are required, and a little opium may be given to relieve great restlessness. Persistent vomiting is best checked by giving an emetic of sulphate of zinc, with plenty of warm water. If this stage is greatly prolonged a hot-air bath may be employed. In the *hot stage* the skin should be sponged freely, and cooling, effervescent or saline drinks be given. During the *sweating stage* nothing is necessary but to keep the patient covered, so as to prevent a chill.

2. *During the Intervals.*—The great remedy at this time is *quinine*, and it rarely fails to bring about a speedy cure. There is much difference of opinion as to the mode in which it should be administered. By some it is recommended to give *one large dose*, either before or at the close of the paroxysm. In a large number of cases which came under my treatment at the Liverpool Northern Hospital, I found most satisfactory results from three or four grain doses, every four or six hours during the intermission, and therefore am disposed to adhere to this practice. In some cases it is said the stomach rejects quinine, and then it may be given with a little opium, or by enema. It is important to notice that the remedy must be continued after the paroxysms have apparently ceased, *i. e.*, until temperature is quite normal. Various substances have been advocated as substitutes. Of these the only useful ones are cinchona bark, cinchonine, and arsenic. The last is decidedly beneficial, and has the advantage of being cheap. It is best given in the form of Fowler's solution, beginning with four or five minims three times a day.

Symptoms and complications may arise requiring special attention. Possibly venesection may be indicated, but I have never met with a case necessitating it in this country. Adynamic symptoms must be treated by external and internal stimulation.

The *preventive* treatment is that for malaria in general, and, if possible, residence in a malarial district should be immediately discontinued.

REMITTENT FEVER.

The malarial fevers of hot climates often assume a remittent type, there being irregular exacerbations and remissions, the latter being less distinct if the fever is very intense. They vary much in their severity, and have received many local names. There is no distinct limit between this class of fevers and intermittents, both being due to the same cause, but this is aided by a high temperature in producing remittents. One type sometimes changes into the other.

SYMPTOMS.—There are generally premonitory signs, but the attack may be sudden. Gastric irritation is usually first noticed, there being uneasiness or oppression at the epigastrium, nausea, anorexia, with headache, general pains, languor, &c. There may be some chilliness or rigors, but there is no *cold stage* of any duration, and the temperature rises immediately. The *hot stage* becomes very intense, the skin being burning and dry, the face flushed, the eyes injected, and there being intense headache, giddiness, restlessness, sleeplessness, and often some delirium, which is sometimes violent. Vomiting and nausea are commonly present, the vomited matters consisting first of food, then of watery fluid, and, finally, of bile. They may become brown or black. There is great oppression and weight in the epigastrium, a furred tongue tending to dryness, parched lips, and intense thirst. The pulse is frequent, either full or small and compressible.

The symptoms abate generally in from six to twelve hours, but may continue for twenty-four, thirty-six, forty-eight hours, or even longer. Some perspiration usually occurs as improvement takes place.

The remission is of variable duration, and then an exacerbation sets in, of greater intensity than the first. The time and number of remissions also differ in different cases. When the disease is established, there is almost invariably a morning remission. The exacerbation may begin at noon, declining towards midnight; or it may begin at midnight, and last till morning. In severe cases there may be a double exacerbation, viz., at noon and midnight.

As the case progresses, there may be signs of intense adynamia. Yellowness of the skin is common and hemorrhages are sometimes present; these symptoms, associated with "black vomit," make a case resemble *specific yellow fever*. Occasionally marked jaundice exists. The spleen and liver are usually enlarged and tender. The *urine* is generally stated to be scanty, dark, and of high specific gravity. In India, Dr. Maclean has noticed just the opposite characters. It is always acid, and *rarely albuminous*. Urea is increased, uric acid diminished, until convalescence.

The *whole duration* is from five to fourteen days usually, and a case may end in death from blood-poisoning or exhaustion; in recovery, usually ushered in by free perspiration, but sometimes gradual; or by transition into an intermittent fever.

TREATMENT.—It is important to attend to hygienic conditions, and to have good ventilation. During the *hot paroxysm* cool drinks should be given, and, if necessary, cold applied to the head. External application of cold, in one of the ways described when speaking of "fever," is most valuable. Vomiting must be checked. As soon as the remission occurs, *quinine* must be given in 10, 15, or 20 grain doses every two hours: if the stomach rejects it, enemata must be employed. This remedy is to be administered until the system is saturated with it, and evidences of "cinchonism" arise. It is also to be used should any complications arise. A compound named Warburg's tincture, has gained much repute in the treatment of remittent fevers.

All antiphlogistic remedies are to be deprecated, as well as the use of calomel, except as an aperient. It is desirable to clear out the bowels. Bland, nourishing diet is necessary, and often stimulants are largely required.

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B. CONSTITUTIONAL DISEASES.

CHAPTER XII.

RHEUMATISM.

THIS term is applied to diseases, which are quite distinct from each other, but, as they are usually considered together, it will be expedient to treat of them all in the present chapter.

1. ACUTE ARTICULAR RHEUMATISM—RHEUMATIC FEVER.

ETIOLOGY.—The immediate pathological cause of rheumatic fever, is the presence in the blood of a poisonous material, produced within the system by some disturbance of the nutritive and eliminatory processes. This is generally presumed to be an ingredient of one of the ordinary excretions, only existing in excess, the common belief being that it is *lactic acid.* The results of experiments seem to favor this view, the usual phenomena of rheumatism having been produced by injecting this substance into serous cavities.

Predisposing Causes.—Rheumatism is distinctly a *hereditary* disease. It occurs chiefly in persons from *fifteen* to *thirty-five,* but especially from *sixteen* to *twenty* years of age, being rare in children and old persons, although no age is exempt. *Previous attacks* decidedly increase the predisposition. More cases are met with among *males,* and in the *lower classes,* on account of greater exposure to the exciting causes. *Climate* and *season* have considerable influence, the affection occurring mainly in *temperate* but *very moist* climates, and where there are *sudden changes in temperature.* It is far less common in tropical and very cold countries. A large number of cases are observed in the eastern counties of England. The same conditions influence the number of cases at different seasons. A *state of ill-health* from any cause is said to predispose to rheumatic fever, and also *mental depression* or *anxiety;* but many individuals are attacked apparently when in perfect health. Joints which are *much used*, or which have been *injured*, are the most liable to become affected.

Exciting Causes.—The ordinary exciting cause is a *sudden chill*, produced either by exposure to cold and wet; sitting in a draught when heated or perspiring; neglecting to change wet clothes, &c. In not a few instances no definite cause can be fixed upon, and it is quite conceivable that processes may go on in the system, which gradually tend to generate an amount of the poison sufficient to produce the complaint. *Errors in diet*, *suppression of menses*, and other disturbances, have been ranked as causes. *Scarlatina* seems to produce rheumatism sometimes, probably by preventing excretion.

ANATOMICAL CHARACTERS.—The morbid changes produced by rheumatism are chiefly evident in fibrous, fibro-serous, or synovial structures. A variable number of the joints are in a state of acute inflammation. The synovial membrane is very vascular, thickened, and relaxed; there may be a deposit of more or less lymph, and the joint contains some fluid effusion. This is not very abundant, chiefly serous, but containing flakes of fibrin and cells, which often resemble pus-cells. The tissues around the joint are much infiltrated with fluid. In cases which have lasted long, pus may form, and the cartilages sometimes become eroded. The sheaths of tendons may be inflamed, and occasionally contain a purulent fluid. The muscles are often dark, soft, and infiltrated.

In addition to the joint affection, there are usually evidences of pericarditis, endocarditis, or myocarditis. Fibrinous vegetations are common in the heart, even when no inflammation exists. Pleurisy and pneumonia are also not uncommonly present, and, rarely, peritonitis, or cerebral or spinal meningitis.

The *blood* contains excess of fibrin, and becomes buffed and cupped during coagulation. The solids generally are diminished, but are in excess in the serum. It is doubtful whether lactic acid can be found in it.

SYMPTOMS.—An attack of rheumatic fever may be preceded by a general state of bad health for some time, and come on gradually; but usually the invasion is marked, there being chills, or occasionally distinct rigors. These are followed by pyrexia, and soon the joints or other structures are affected.

When the disease is established, the symptoms are, as a rule, very characteristic. The patient presents an aspect of pain and suffering, with restlessness and weariness, but is unable to move on account of the pain which is thus produced, and often there is complete helplessness. Usually *copious perspiration* exists, the patient being bathed in sweat, which has a peculiarly sour or acrid smell, and is usually very acid in reaction. Sudamina are not uncommon, and may be extremely abundant, coming out in successive crops. I have at present a case under treatment in which the trunk and limbs have been from an early period completely covered with sudamina.

There are the usual symptoms of pyrexia. The pulse is generally full and strong. The tongue is thickly coated, with much thirst, anorexia, and constipation. The urine is markedly febrile, deposits urates abundantly, and sometimes contains a little albumen. Patients cannot sleep on account of the pain they suffer, but there are no particular head symptoms as a rule. Occasionally slight delirium exists.

State of the Joints.—Pain and stiffness are generally complained of over the body, but the joints become especially affected. It is the *middle sized* joints which are most commonly attacked, viz., the elbows, wrists, knees, and ankles, but the others are by no means exempt. Usually several are involved in succession, the complaint showing an *erratic* tendency, and often the symptoms subside in one articulation, as they appear in another, but several may be implicated together. A joint may be attacked more than once in the course of the disease. A disposition to *symmetry* is frequently noticed.

An affected joint is more or less red, either all over or in patches, swollen, and hot. The amount of enlargement varies, and it is due partly to infiltration of the tissues around the joint, partly to effusion into its interior. The skin sometimes pits on pressure. There is considerable *pain* and *tenderness*, which is aggravated at night; any movement causes much distress. In character the pain is dull and aching as a rule, and it is often so severe as to make the patients cry. If much swelling exists there is frequently less suffering.

The general symptoms are not always in proportion to the extent of joint mischief.

Temperature.—The *ascent* usually lasts about a week, but it may be longer or shorter. The temperature in most cases ranges from 100° to 104°. The *stationary period* varies greatly in duration; there is generally a considerable difference between morning and evening temperature. *Defervescence* is also gradual and indefinite in most cases. Rarely *crisis* occurs. The implicated joints may indicate a higher temperature than other parts. It is in cases of rheumatic fever that *hyperpyrexia* is most frequently observed, a remarkably sudden increase of heat taking place, accompanied with severe symptoms, and death usually speedily ensuing. The temperature may reach 108°, 109°, 110°, or more, and continue to rise after death.

Irregularities in temperature are very common in rheumatic fever, even without the influence of any complications, and the latter are often not indicated by the thermometer in this disease.

There is often a disproportion between the temperature and the pulse.

A *subacute* variety of rheumatism is by no means uncommon, especially in hospital practice, which is very troublesome. There is very little pyrexia, and one or more joints are affected for a long time, the conditions being almost stationary, with occasional exacerbations, which are liable to occur from slight causes or without any evident cause. The joints are not much deformed, nor are they structurally altered to any great degree. The general condition is usually much below par.

COMPLICATIONS.—In most cases certain internal organs and structures are implicated in the course of a rheumatic attack, and the resulting affections are ordinarily classed as complications, but in reality most of them are *parts of the disease*, and they may exist without any joint affection. At present they will be merely enumerated, as their symptoms and signs are described in other parts of this work, but it must be mentioned that they may come on very insidiously, and should, therefore, be constantly watched for, especially in the case of the heart, this organ being examined *at least twice daily.* They must necessarily influence greatly the course of a case. They include: 1. *Cardiac affections*, viz.: pericarditis, endocarditis, with consequent valvular disease, myocarditis, and the formation of fibrinous deposits in the heart. 2. *Pulmonary affections*, viz.: pleurisy, pneumonia or bronchitis. 3. Rarely peritonitis. 4. Cerebral and spinal meningitis very rarely.

The *cardiac affections* are those observed in the great majority of cases; some think endocarditis, others pericarditis is the more frequent. They occur especially in the young, and are met with in cases of all grades of severity. In not a few instances both the heart and lungs, with their coverings, are inflamed at the same time.

Choreiform movements sometimes complicate acute rheumatism, or even distinct chorea, especially in children. The relation between them is a matter of doubt. It is supposed that the chorea is due to the plugging of the small vessels of some part of the brain with small particles of fibrin from the heart.

Mention has already been made of the rapid rise of temperature in some cases. This is accompanied with rigors, violent nervous symptoms, and sometimes jaundice, diarrhœa, hemorrhages, &c. In some instances typhoid symptoms set in during the progress of a case of rheumatic fever.

DURATION AND TERMINATION.—The duration is exceedingly variable, but favorable cases generally are convalescent within from three to six weeks. Relapses are frequent. The *termination*, in the great majority of cases, is in recovery, but unfortunately this is often only partial, some permanent organic mischief being left. Sometimes stiffness of joints remains for a considerable period, or they may become chronically affected; they are also liable to subsequent neuralgic pains. If death results, this is generally due to complications.

DIAGNOSIS.—Gout is the chief disease from which rheumatism has to be diagnosed; the points of difference will be considered under gout. Ordinary articular rheumatism has also to be distinguished from other forms. It may be simulated by erysipelas, pyæmia, trichinosis, dengue, or the early stage of glanders. It must be remembered that rheumatism may occur *without any joint symptoms.*

PROGNOSIS.—As regards life and death the prognosis is very favorable, but in many instances it is grave with respect to the future condition of the patient. Of course this will depend on the organic mischief remaining. There are some signs of danger, viz., a very high temperature, or one remaining high for some time; severe nervous symptoms; adynamic symptoms; extensive complications about the heart or lungs; cerebral or spinal meningitis; deficiency of excreta. Chorea is considered to be a highly dangerous complication, especially when associated with dysphagia. I have, however, seen recovery take place when these were present.

TREATMENT.—Probably there has been more difference of opinion about the treatment of rheumatic fever than of almost any other disease, and it is very perplexing for beginners to know what to do, when they read the contradictory statements made with regard to this matter. Having had opportunities of treating a large number of cases in hospital practice, I venture to hope that the remarks here made on the subject may not be altogether valueless.

The indications for managing a case of rheumatic fever seem to me to be these: 1. To study the general comfort of the patient, and to protect in every possible way from exposure. 2. To use all measures to prevent the internal parts from becoming involved. 3. To encourage free excretion. 4. To remove or neutralize the poison in the blood, if this can be done. 5. To attend to the joints. 6. To relieve other symptoms. 7. To treat complications as they arise.

Of course it is desirable that a patient suffering from rheumatic fever should become convalescent as soon as possible, but it is a matter of much greater consequence that the attack should be passed through without any permanent organic mischief being left behind, especially in connection with the heart, than that recovery should take place within this or that number of days or weeks.

There are certain matters connected with *general management,* attention to which is always of the greatest importance. The patient should be placed in a comfortable bed, *between soft blankets*, and wear a flannel shirt, the limbs being fixed in as comfortable a position as possible, by means of pillows. It is necessary to avoid anything like a chill, hence the bed should be carefully protected from all draughts, and patients should not be allowed to throw off the bedclothes, which they are much inclined to do. It is my custom to wrap up *all the joints*, whether affected or not, in cotton-wool, and also to put a thick layer of this *over the front of the chest*. It is further advisable to cut the shirt in such a way as to make a kind of window over the region of the heart, by drawing aside which this region may be examined without disturbing the patient, or exposing much of the chest. The wool must be frequently changed, the surface being dried before each fresh application is made.

The diet ought not to be *too low*, but should consist of a good quantity of beef tea and milk, regularly administered. Much drink is needed, and the best is lemonade or barley-water. Ice is also very agreeable to the patient. *Alcoholic stimulants* are not required in ordinary practice as a rule; still, in hospital practice patients often need them, and sometimes in considerable quantity. If there is a tendency to much debility and prostration, they should decidedly be given.

It is necessary to keep the bowels regularly open, but the treatment of acute rheumatism by the use of strong purgatives, as practiced by some, seems to me most objectionable.

General Therapeutic Treatment.—Observations have been made, especially by Sir W. Gull and Dr. Sutton, with the view of proving that rheumatic fever runs as favorable a course without as with medicines. Possibly this may be true, if the conditions already mentioned are carefully attended to. At the same time my own experience would lead me to attribute good results to the *alkaline treatment*, as I have seen unmistakable benefit arise from it. Whether it shortens the course of the disease or not, it is impossible to say, but it certainly appears to have an influence over the joint-affection, and I am inclined to think it tends to prevent the heart structures from becoming involved. This statement is founded on the fact that at the Liverpool Northern Hospital, where a large number of these cases were admitted, this was part of the treatment adopted, and *heart complications occurred very exceptionally, provided they were not present at the time of admission.* The *bicarbonate of potash* is what I usually employ, either given in doses of ʒ½ to ℈ij every three or four hours, or ℥½ or more being dissolved in a quart of barley-water, and consumed during the twenty-four hours. Much larger doses are recommended by some practitioners, and others prefer the salts with the vegetable acids, such as the *citrate* or *tartrate*, and these may be made into a pleasant drink.

Opium is another remedy of great value. It is best given in the solid form, in doses of one-fourth of a grain to a grain every three or four hours, according to circumstances. It not only relieves pain, procures sleep, and sustains the nervous system, but it *also calms the heart's action*, and thus, *by inducing rest, tends to prevent cardiac inflammations.* Morphia is also very useful, and it may be administered by subcutaneous injection.

It is necessary to allude to the chief of the numerous plans of treatment which have been advocated in this disease, some of which deserve a more extended trial than they have yet received.

I pass over venesection, calomel, and tartar-emetic as being entirely out of date, and few would think of recommending them at the present day. Some prefer the *salts of soda* to those of potash. *Nitrate of potash* has been much used, in quantities of from ℥ss. to ℥i in twenty-four hours. *Iodide of potassium, phosphate of ammonia, benzoates*, and various other salts have also been tried. *Lemon-juice* has its supporters, from ℥iij to ℥xij or more, being given in the twenty-four hours. Having seen it used in several cases, it did not impress me favorably. Some recommend *quinine* or *cinchona bark* in full doses; the former may be conveniently combined with alkalies, as advised by Dr. Garrod. Recently *tincture of steel* has been extensively tried at University Hospital, as recommended by Dr. Reynolds. It is doubtful whether the results are altogether satisfactory. *Potassio-tartrate of iron* has been well spoken of. *Sulphur* and *guaiacum* have also been recommended, but they seem more useful in the chronic variety. Many use colchicum, but it is of doubtful value in rheumatism.

Certain remedies which act powerfully upon the heart have been employed, viz., *aconite*, *digitalis*, and *veratrum viride*, especially the last. They may have the effect of diminishing the tendency to cardiac inflammations, but require careful watching.

Dr. Herbert Davis treats acute rheumatism by blistering each joint as it becomes affected, the blisters encircling the limbs, this being followed by the application of linseed-meal poultices.

Various baths have been tried, especially the hot-air bath. Lately Dr. Wilson Fox has treated some cases by a form of cold bath, water being poured over the patient as he lay in bed on a mackintosh, wrapped in a blanket, but this treatment does not appear to have been efficacious.

Local Treatment.—If possible, it is desirable not to apply anything to the joints except cotton-wool, but in some instances the pain is so great that local applications must be made. As a rule warm anodyne fomentations or poultices give most relief, containing opium, belladonna, or their active principles, or atropine. To be of any use they must be put on very hot, well covered with mackintosh, and frequently changed. I have often tried the local application of an alkaline solution, as recommended by some, but it has not appeared to be of much service unless opium is also used. Possibly two or three leeches might be advantageously employed occasionally. Free blistering with liquor epispasticus certainly not unfrequently gives speedy relief. It is not uncommon for a joint to show a tendency to become chronically affected after the general symptoms have subsided. If this happens, blistering, or application of tincture of iodine, may be first tried, but if a speedy effect is not produced it is best to strap the articulation carefully with plaster of ammoniacum. If there is much effusion tapping the joint by means of an aspirator has been suggested.

As already stated more than once, hyperpyrexia is apt to come on in acute rheumatism. Under these circumstances recourse must be immediately had to the use of cold, as described under fever, with quinine in full doses internally, and *large quantities of stimulants.* The cases lately successfully treated by Dr. Wilson Fox prove that patients may be saved when in an apparently hopeless condition.

The treatment of the various inflammations will be again considered in their proper sections. At present I will only express the opinion that very rarely is any kind of bleeding justifiable, and *the use of calomel never*. Fomentations externally, and opium internally, are the chief remedies, followed by blisters, if there is pericardial effusion. Opium must be used with caution if the lungs are involved, and free stimulation is necessary. In cerebral or spinal meningitis ice may be applied locally.

Much care is needed during convalescence, flannel being worn, and all exposure avoided. The diet should be improved gradually. The patient should be kept under observation until quite convalescent, and have full instructions as to how to guard against future attacks.

2. Chronic Articular Rheumatism.

Symptoms.—This affection is very common among old persons, usually coming on gradually as age advances, but occasionally following an acute attack. The fibrous structures connected with and around the articulations become thickened and stiff. Hence movement is impaired, and there is more or less dull, aching pain, which is worse at night and during damp or cold weather. There are no particular objective signs, and the joints are not much altered in form. Probably this condition may be associated with chronic changes in the valves of the heart.

Treatment.—Patients suffering from this complaint should wear flannel next the skin, and avoid exposure or changes of temperature. Baths of various kinds are useful in different cases, viz., warm, vapor, hot-air, Turkish, cold, salt-water, sulphur, or alkaline baths. These may also be employed locally. *Systematic daily friction* of the affected parts often does much good, with some stimulating and anodyne liniment, such as camphor liniment, with laudanum, tincture of aconite or belladonna; also shampooing and kneading. Local counter-irritation by blisters or tincture of iodine, sometimes is beneficial. Good results ensue often from carefully strapping an affected joint with some plaster, such as emp. ammoniaci, red plaster, or Burgundy pitch plaster. It is always well to keep the joints bandaged. Patients should be encouraged to take a moderate amount of exercise. Electricity is strongly advocated by some practitioners in the form of the constant current.

The *internal* remedies which yield the best results are tonics. Quinine and cod-liver oil, or tincture of iron, often do good. Iodide of potassium with decoction of bark is also useful. Sulphur, guaiacum, sarsaparilla, and many other things, have been recommended as specifics. It is often necessary to give some anodyne to relieve pain, and procure rest at night. Various mineral waters are sometimes serviceable, such as those of Buxton, Bath, Harrogate, Cheltenham, and some of the German spas. Vichy water may be tried.

Attention must be paid to diet, which should be nutritious and easily digestible. A little stimulant is generally beneficial.

3. Muscular and Tendinous Rheumatism—Myalgia.

The muscles are frequently the seat of a very painful affection, supposed to be rheumatic, probably also involving the fibrous structures.

Etiology.—The *exciting cause* is either exposure to cold and wet, or to a *direct draught*, or excessive exercise of the muscles. The complaint usually occurs in adults, and some forms of it are most common among laboring men. One attack predisposes to another, and gout seems to increase the tendency to the disease.

Symptoms.—In most cases the first attack is acute, and it often comes on quite suddenly, or sets in during the night. The symptoms are pain in the affected muscles with some tenderness, and considerable stiffness, with difficulty of movement, which causes much pain. The degree of suffering varies considerably, but it may be intensely severe; it may only be felt on moving the affected muscles, or likewise when they are at rest, being sometimes associated with spasm. In acute cases heat frequently increases the pain, and it is also worse at night, so that patients suffer more when in bed. Steady pressure in many cases gives relief. There are no objective signs, except that it is evident the patient keeps the involved muscles as much at rest as possible. There is no pyrexia, or only very slight constitutional disturbance, on account of the pain and want of sleep. No tendency exists to any cardiac inflammation.

In the acute form the complaint only lasts a few days as a rule, but it often becomes chronic, or is liable to return. When it is chronic, heat generally relieves, and cold and damp weather makes the pain worse.

VARIETIES.—Muscular rheumatism may be met with in the voluntary muscles in any part of the body, and it is even believed that it may attack the involuntary muscles. Its most frequent and important seats, however, are as follows:

1. *Cephalodynia*, or rheumatism of the scalp, which is attended with a form of headache, increased on moving the muscles, with much soreness on pressure.

2. *Torticollis, wry-neck, or stiff-neck.*—This is a very common variety, involving the muscles of the neck, especially the sterno-mastoid. Usually it is limited to one side, towards which the neck is immovably twisted, great pain being experienced on attempting to turn. The muscles of the back of the neck may be implicated.

3. *Omodynia, Scapulodynia, Dorsodynia.* — These are very commonly observed, especially among laboring men, the muscles about the shoulders and upper part of the back being affected.

4. *Pleurodynia, or Rheumatism of the Chest-walls.*—The muscles of the chest are very often implicated, usually those of the left side. The intercostals, pectorals, or serratus magnus may be involved, and it has appeared to me that the pain is frequently seated over the interdigitations of the serratus with the external oblique. It is very commonly situated in the left infra-axillary region. It may be exceedingly intense, and is increased by any movement which brings the muscles into play. Respiration is imperfectly carried on on the affected side, and such acts as coughing or sneezing are very distressing. Not unfrequently the chief pain is localized in a point, and is of a catching character, while pressure on this point increases it, though diffused pressure with the palm may give relief. In other instances it alters its position. This affection simulates pleurisy, but is at once distinguished from it by the absence of physical signs. It often comes on as the result of cough, and both sides may be then affected. Phthisical patients commonly suffer from it.

5. *Rheumatism of the Abdominal-walls* is an exceedingly painful

complaint, and may be mistaken for peritonitis. It not unfrequently comes on as the result of straining during cough.

6. *Lumbago.*—The muscles and fasciæ in the lumbar region are among the most common seats of this complaint. It may set in with peculiar rapidity, and is usually very severe. Generally both sides are affected. There may be constant aching pain, but this is increased greatly on any attempt being made to bring the muscles into action, and becomes of a sharp, stabbing character. The patient keeps the spine quite stiff, and generally a little bent forward; any attempt to stand erect, *or to get up from the sitting posture,* aggravates the suffering greatly. Sometimes the patient cannot stir from bed. Pressure causes much pain, and so does heat often.

In addition to these varieties, muscular pains are common enough in the limbs in different parts. Sometimes cases are met with in out-patient practice, in which it appears as if the plantar fascia and muscles were involved. The diaphragm is occasionally the seat of rheumatism, which causes great distress. The muscles of the eye may also be affected, and here it may be mentioned, that the fibrous and muscular structures of this organ are subject to rheumatic inflammation. The sheaths of nerves also suffer, and thus very painful neuralgic affections arise.

TREATMENT.—The affected muscles must be kept at rest, and in some cases this is all that is required. I always treat *pleurodynia* by firmly strapping the affected side by broad strips of plaster, extending from mid-spine to mid-sternum (as will be more fully described under pleurisy), and this rarely fails to give complete relief. In lumbago also, the application of a wide piece of emp. roborans across the back, and over this a flannel bandage, passing twice round the body, always gives great comfort. In acute cases warm fomentations, containing some anodyne, are frequently useful, or turpentine fomentations. Dry heat does not generally answer well, as it increases the pain, but sometimes, if persevered in, it does good. Gentle friction is often beneficial. In lumbago the subcutaneous injection of a little morphia generally affords very considerable relief, and patients ask to have it repeated. Internally the administration of bicarbonate of potash with iodide of potassium seems to answer best. An opiate may be necessary to relieve pain. Exciting free diaphoresis by means of a warm drink, and then wrapping up in blankets, or by the use of a vapor-bath, in some cases produces a rapid cure. In rare instances it might be advisable to take away a little blood locally, by leeching or cupping.

In chronic cases the internal remedies which do most good, are iodide of potassium, quinine, or chloride of ammonium. Sulphur, guaiacum, arsenic, mezereon, and various balsams and resins, have been recommended; also colchicum, if there is any gouty tendency. Flannel should be worn next the skin. Rest, pressure, friction, with stimulating and anodyne liniments, sinapisms, blisters, and local baths or douches, with shampooing, constitute the usual local measures employed. Galvanism is sometimes attended with success. It may be advisable to have recourse to subcutaneous injection of morphia daily, for a few times in succession.

4. Gonorrhœal Rheumatism.

Symptoms.—During the course of gonorrhœa, especially in young and plethoric persons, an affection of the joints may set in, as the result of exposure, the knee-joint being that most commonly attacked. The ankles, feet, or hip-joint are also not unfrequently implicated. There is considerable pain, with swelling, and a tendency to much effusion and exudation, which gives rise to great tension, but suppuration does not occur. The inflammation is very liable to recur, and to lead to permanent changes in the joint, which may remain stiff for a long time, with a crackling sensation on movement, or destruction of the cartilages and anchylosis may ensue. This complaint may become chronic. It is accompanied by much constitutional disturbance.

Treatment.—The affected joints must be kept at rest, and well fomented. When the knee-joint is implicated, the limb should be extended on a splint, as it is apt to become bent. In the acute stage Dover's powder may be given, in addition to the ordinary remedies for gonorrhœa. Afterwards iodide of potassium is useful, with tonics and stimulants, if the patient is weak. Friction, shampooing, and movement of the joint, must be carefully practiced when the case becomes chronic. Strapping it might be useful.

5. Rheumatoid Arthritis—Arthritis Deformans.

Etiology.—This is a curious form of joint inflammation, which ends in great deformity. It occurs in those who are debilitated, and whose circulation is languid. Most cases are met with between twenty and forty years of age, and among females. The complaint almost always is observed among the poor, who have lived badly. It may be traced to cold or damp, sometimes to injury, but there may be no obvious cause. It is doubtful whether it is at all hereditary.

Anatomical Characters.—At first there is redness and increase of synovia. After a time the capsular ligament is greatly thickened, with irregular proliferations, and the synovial fluid becomes much diminished. The internal ligaments may be destroyed, leading to dislocations. Within the articulation are fibrous bands, and there may be cartilaginous or bony masses. The interarticular fibro-cartilages break down and disappear, as do the cartilages covering the ends of the bones. The ends of the bones become smooth and eburnated to a greater or less extent, being also enlarged, sometimes considerably, and either regular, or, more commonly, very irregular, owing to osseous protuberances. *There is no deposit of urates.*

Symptoms.—This affection may be *acute* or *chronic.* In the former case several joints are involved, *but there is no erratic tendency,* such as is observed in ordinary rheumatic fever. Pyrexia is present, but *not profuse sweating, nor does the heart become implicated.* In the chronic variety one joint is first affected with a little pain and swelling, but it recovers; in a short time it is again attacked, and remains permanently altered, becoming worse. Other joints then are involved in succession, until all those of the limbs may be observed in various stages of alteration, and also the temporo-maxillary and upper cervical articulations. As a result the joints become rigid, motionless, and either permanently bent or extended; there is more or less distortion with nodulation, contraction, and wasting of the muscles, the patient being finally completely crippled. At first there may be signs of fluid in a joint. In some cases dislocation takes place. The pain may be very considerable, especially at night. There are no particular constitutional symptoms. The hands are usually crippled before the feet. On the former also little nodular thickenings of the epiphyses of the phalanges, "digitorum nodi," are sometimes met with, especially in connection with the terminal phalanges, generally supposed to be of the nature of rheumatoid arthritis, but others believe them to be gouty.

Other parts are occcasionally involved in this disease, viz., the sclerotic, internal ear, or the larynx.

DIAGNOSIS.—This disease has to be distinguished from gout, ordinary rheumatism, acute or chronic, and gonorrhœal rheumatism. The marked structural changes and deformity distinguish it from ordinary chronic rheumatism, and from gonorrhœal, the latter also having a different history. The diagnosis from acute rheumatism and gout will be pointed out after the latter affection has been considered.

PROGNOSIS.—Acute cases, if properly treated, may do well. If the disease is chronic and advanced some improvement may be effected, but not much as a rule.

TREATMENT.—There is always a low state of the system, and patients need a sustaining plan of treatment, which must be persevered in. The general health requires every attention; the diet must be very nutritious and easily assimilable; and wine is decidedly beneficial, or some other form of stimulant. Warm clothing, an equable climate, pleasant occupation, and moderate exercise, with baths, are advisable.

Iron and quinine, with cod-liver oil, are the most efficient internal remedies. Syrup of iodide of iron, iodide of potassium, arsenic, guaiacum, and various other medicines, have been favorably spoken of. Strychnine or nux vomica may be tried if the muscles have wasted much. Various mineral waters sometimes are beneficial.

In early cases local counter-irritation is decidedly useful, but it does not produce much effect after a time. In a case recently under my care free bathing with salt and water, followed by friction, seemed to do most good; systematic strapping of the joints, friction with various liniments, shampooing, and careful movement, may also be attended with benefit.

CHAPTER XIII.

GOUT—PODAGRA.

Etiology.—Gout is a very *hereditary* complaint, and this is shown partly in its earlier occurrence. It is rarely met with before puberty, or even under thirty, except in hereditary cases; most first attacks occur from thirty to thirty-five, and the disease does not often commence late in life. Males suffer much more than females. Those who are of sanguine temperament, plethoric, and corpulent, are most subject; but thin, nervous, wiry persons are also liable to be attacked. Individuals who work in lead are decidedly prone to become gouty; and, on the other hand, gouty people readily suffer from lead-poisoning. Cold and temperate climates are the worst, especially those which are damp and changeable. Spring is the most favorable season for gouty attacks, and then autumn.

The combination of circumstances most conducive to the development of gout is *indulgence in certain alcoholic drinks, with excessive consumption of food, especially animal food, and deficient exercise, with general luxurious habits.* Hence it is a disease considerably more prevalent among the better classes. It is also not uncommon among publicans, butchers, butlers, and others who are able to indulge in these habits. There is a form of "poor gout," produced by drinking much beer, while at the same time living badly, but a hereditary tendency may be discovered in some of these cases.

With regard to the form of *alcoholic stimulant* most injurious, *wines* and malt liquors are worse than spirits. *Port-wine* stands first, then come burgundy, madeira, marsala, and sherry. The lighter wines are not so hurtful. Rum is said to be a frequent cause of gout. Sweet and unfermented cider is also believed to produce it.

Many persons who become gouty suffer previously from dyspepsia, with acidity, and signs of portal congestion.

The *immediate pathological cause* of gout is now generally believed to be the presence of excess of *uric acid* in the form of *urate of soda* in the blood, this substance being produced in excess, in conseqence of the habits above mentioned, and the kidneys being unable to excrete this excess. During an acute attack, uric acid may be detected in abundance in the blood-serum, and, in long-continued chronic cases, it may be obtained from this fluid at any time. It is also found in the fluid of blisters or serous inflammations, and in dropsical accumulations.

Exciting Causes of a Gouty Fit.—An attack of gout may have no evident cause, or is brought on by exposure to cold or wet; slight injury; excessive exertion and fatigue; mental labor; violent or depressing emotions, such as rage or grief; overeating or drinking, and indulgence in indigestible food, &c. It is not by any means clear how it is directly induced pathologically.

ANATOMICAL CHARACTERS.—Gout is characterized by the deposit of urate of soda from the blood in various structures, especially in those forming the joints, and such as are not very vascular. This is accompanied with signs of inflammation. In an acute case these are marked, there being increased vascularity and swelling of tissues, with effusion in and around the joint. Even in the first attack a deposit probably takes place, and this increases with each subsequent paroxysm. In an early case only the metatarso-phalangeal joint of the great toe is usually affected, but subsequently other articulations are involved, so that almost all may be finally implicated. The deposit first occurs in the superficial part of the cartilages, in the form of fine crystalline needles or prisms, forming a more or less close network, and presenting different degrees of opacity. Subsequently the fibro-cartilages, ligaments, and synovial membranes, &c., are affected, the entire surface being more or less irregular, and covered with white, chalky-looking deposits, consisting of urate of soda. The synovial fluid may also contain crystals of the same. Owing to the infiltration of the ligaments, the articulations become stiffened or anchylosed. In long-continued cases, the joints become ultimately greatly distorted, and the skin over them may be destroyed, exposing the chalky-looking masses. The periosteum and mucous bursæ may be also implicated, and some believe even bone itself.

Deposits are found in other parts, such as the external ear, eyelids, nose, larynx, &c.

The *kidneys* become altered, probably at an early period. At first a deposit of urate occurs within the tubuli, and this extends into the intertubular tissue. White streaks are seen in the direction of the tubuli of the pyramids, and at the extremities of the papillæ. Ultimately the organs become greatly contracted and indurated, as well as the seat of extensive deposit. This condition of the kidney will call for fuller notice hereafter.

SYMPTOMS.—Cases of gout are divided into two classes, according as the symptoms are associated with the joints, or with some internal organ.

1. *Regular or Articular Gout.*—At first this is an *acute* affection, but after a time it tends to become *chronic.*

A. *Acute Gout.*—The first attack often comes on without any premonitory indications, but not always, and in subsequent fits something usually occurs to warn of their approach. The most frequent precursory signs are derangements of the alimentary canal, with heartburn, acidity, &c., which may be accompanied with palpitation, or this may exist alone; nervous disturbances, such as headache, giddiness, disturbed vision, drowsiness, and heaviness, irritability of temper, languor, restless sleep, with unpleasant dreams, starting of the limbs, cramps in the calves of the legs or other parts; asthmatic attacks; profuse sweats; or changes in the urine, which becomes scanty with much deposit, or very abundant and watery. These symptoms are supposed to result from the presence of the poison in the blood. In some cases the patient feels unusually well, both mentally and bodily, before an attack. There may be some unpleasant local sensations.

The onset usually takes place during the night, especially from 2 to 5 A.M. In the large majority of cases, the *metatarso-phalangeal articulation of the great toe* is that first affected, generally on one side, but sometimes on both, or they may be involved alternately. In some instances it is only this joint that is implicated during several attacks, but others, as a rule, become soon invaded, a number being affected during a fit, either together or in succession, though the complaint tends to be limited for some time to *the smaller joints of the feet and hands.* Exceptionally, the knee or ankle may be first affected, but very rarely the articulations of the upper extremity.

Characters of the Joint-affection.—The subjective sensations are extremely severe. The *pain* rapidly increases until it becomes agonizing and unbearable, being described as burning, tearing, plunging, boring, or piercing. There is exquisite tenderness, so that the slightest touch cannot be borne. These sensations are usually much worse during the night, and remit during the day. Soon the joint becomes red and hot, with much swelling, on account of effusion into its interior, the skin being tense and shining, and after a while there is considerable œdema, with pitting on pressure, some relief accompanying these appearances. The veins also are enlarged. As the inflammation subsides, desquamation of the cuticle takes place, and troublesome itching is often experienced. Œdema may hold on for some time.

It is in the early attacks and in full-blooded persons that these conditions are most marked. Subsequently the pain, &c., are greatly diminished, and in weakly individuals, especially females, the characters of the joint-affection are not nearly so severe.

Constitutional symptoms of greater or less severity are present during the paroxysm, being in proportion to the intensity of the local symptoms, and the number of joints involved. Chills, or even distinct rigors occur, followed by the ordinary signs of pyrexia, usually with perspiration. The *urine* is very scanty and dark, and deposits urates abundantly, of variable color. Uric acid is *absolutely* in lesser quantity, though *relatively* in excess. Much restlessness and sleeplessness necessarily exist, and not uncommonly there are cramps in the legs. At the close there may be critical perspiration, diarrhœa, or abundant sediment of urates in the urine.

The *duration* of a gouty fit varies from four or five days to several weeks, in the latter case there being remissions or intermissions. It increases as the case advances. *Recurrence* is a characteristic feature of gout, though it does not invariably happen. At first, the attacks generally come on once a year, in the spring; then twice, in spring and autumn, and afterwards more frequently.

Some do not recover their usual health for a considerable time after a fit, others feel much better. Soon permanent changes are produced in the affected joints.

B. *Chronic Gout.*—This term is applied to those cases in which the joints become permanently much altered in structure and form, and where the attacks are frequent, as well as chronic in duration and intensity, indeed in some instances being never altogether absent, at the same time other structures becoming involved. The articulations become stiff, immovable, enlarged, nodulated, and deformed, owing to the extensive deposit in connection with their tissues. The skin appears blue and congested over them, the veins being enlarged. Finally, it may rupture, and the masses of urate be exposed, named "chalk-stones or tophi," which may be discharged as a yellowish-white substance, or suppuration and unhealthy ulceration is set up.

In time other parts are affected, such as tendons, bursæ, the periosteum covering the shafts of bones, aponeuroses, and the sheaths of muscles. These may lead to gouty abscesses. Small deposits also occur in connection with the helix of the external ear, the cartilages of the eyelids, the nose, and the sclerotic. At first they are liquid, and, when punctured, a whitish matter is discharged, containing abundant crystals; ultimately they become solid, and form little hard nodules or beads. These chalk-stones sometimes set up inflammation, and hence are not always of uniform composition; a little phosphate of lime may be present.

Patients suffering from chronic gout are almost always weak and wanting in tone. They may have a sallow and pale aspect, or are sometimes plethoric, but flabby-looking. They suffer from various disorders of digestion, and disturbances about the heart, in the way of palpitation or irregular action, being also irritable, or depressed and restless, and having cramps, twitchings, &c. From time to time there may be a little feverishness. The urine is generally pale, of light specific gravity, deficient in solids, and often slightly albuminous; it sometimes contains casts, there being, in fact, a peculiar affection of the kidneys, which will be described when treating of the diseases of those organs. The skin is often subject to various eruptions, such as urticaria, erythema, eczema, psoriasis, prurigo, and acne.

2. *Irregular, non-articular, misplaced,* or *retrocedent gout.*—These terms are applied to gout when it attacks internal parts, which it may do from the outset, or, it is supposed, it may recede suddenly from the joints, and involve internal organs by metastasis, then called "retrocedent." The chief complaints usually attributed to gout are as follows:

a. Nervous disorders, such as severe headache; mental disturbance, the intellect being impaired, or delirium or mania setting in as the result of retrocedent gout; epileptiform seizures; various neuralgiæ and other altered sensations; startings of the limbs, cramps, or local paralysis. It is believed by some that a form of meningitis may occur. Apoplexy is common among gouty subjects, but it is probably due to the fact that the vessels are generally diseased.

b. The *stomach* is one of the organs most commonly affected. There may be actual *gastritis,* with much pain and tenderness, vomiting, &c., or merely a *neurotic disturbance,* attended with sudden spasmodic pain of great intensity, but relieved by pressure, with a sense of oppression, great anxiety and distress, and sometimes much prostration and collapse. Dysphagia is occasionally complained of. In some cases *intestinal colic* and *diarrhœa* are present. There is often evidence of the liver being out of order.

c. The *heart* is also liable to grave disturbance. There *is no true gouty inflammation,* though white patches on the pericardium and chronic changes in the valves are frequently observed. The cardiac action is greatly disturbed in some cases, being weak, or very slow or rapid, or there is irregular or intermittent palpitation; at the same time the pulse is feeble and small, and a tendency to syncope or collapse exists. Painful or disagreeable sensations are experienced over the cardiac region, with a feeling of constriction, dyspnœa, and much anxiety.

d. In connection with the *respiratory organs* a form of asthma is often met with, and also bronchial catarrh, with much cough. Pulmonary congestion may occur, but inflammation is very uncommon.

e. The changes in the *kidney* have been already alluded to. Chronic cystitis and urethritis are not infrequent, especially among old people. Gravel and calculus are often present, and oxalic acid is passed in the urine in many cases.

DIAGNOSIS.—Rheumatism and rheumatoid arthritis are the two diseases from which gout has to be chiefly diagnosed. The points of difference between these three affections may be thus arranged:

	Gout.	Rheumatism.	Rheumatoid arthritis.
1. *Hereditariness.*	Very marked.	Less marked.	Doubtful.
2. *Social position.*	Among the better classes, or those who overfeed and drink.	Among the poorer and hard-working classes chiefly.	Among the poor and ill-fed.
3. *Age.* . . .	Very rare in early life. Most first attacks from 30 to 35.	Common in early life; chiefly from 16 to 20.	Usually from 20 to 40.
4. *Sex.* . . .	Much more prevalent among males.	More among males, but to less degree.	Chiefly among females.
5. *Mode of onset.*	Often no obvious cause of first attack, and this is preceded by digestive derangements, and other premonitory symptoms.	Usually follows an obvious cause, viz., cold, and frequently no previous symptoms.	Exciting cause may be evident, or not. Preceded by much exhaustion and debility.
6. *Joint affection.*	The *smaller* joints are most affected, especially the *great toe; no erratic* tendency. Local symptoms very intense, and there is much œdema, a shining appearance, enlarged veins, desquamation occurring after the attack. In time there is permanent enlargement with distortion, and *deposit of urates.*	*Medium-sized* joints most involved; *erratic;* symptoms less severe, and less œdema present; no enlargement of veins, or desquamation.	*All joints* equally attacked; *not erratic;* symptoms are not severe, but tend to long continuance. Ultimately deformity is produced, but *no deposit of urates* occurs.

	Gout.	Rheumatism.	Rheumatoid arthritis.
7. *General symptoms.*	Pyrexia, variable in amount; much constitutional disturbance; considerable morning remissions.	Considerable pyrexia, more continuous.	Only slight pyrexia. Symptoms of debility.
8. *Perspiration.*	No special characters.	Very profuse and *acid.*	No acid sweats.
9. *Course, duration, and progress.*	Early paroxysm of short duration; great tendency to recurrence, and to *periodicity.*	Attack of longer duration; much less tendency to recurrence; not periodic.	Subacute and gradually progressive; often no complete intermission; not periodic.
10. *Complications.*	Affects especially the *stomach, brain, kidneys,* and *produces nervous disturbance of the heart,* but *not inflammation.*	*Cardiac inflammations* especially; also *lung inflammations.*	Nothing in heart, &c.
11. *Uric acid in blood*	Present.	None.	None.
12. *Tophi in auricle, &c.*	Present.	None.	None.
13. *Urine...*	Deficiency of urates before and during the fit, followed by excess; albuminuria common; may have casts, indicating kidney disease.	Febrile; sometimes slight albuminuria.	No special characters.

PROGNOSIS.—Acute gout is rarely immediately fatal, but when it attacks internal organs, it is very serious. It is always liable to return, but much depends upon the mode of living which the patient adopts. The prognosis is worse in proportion to the *youth of the patient,* the *degree of hereditary tendency,* and the *frequency of the attacks.* Chronic gout decidedly shortens life. The most serious signs are those indicating advanced renal disease, with non-elimination of uric acid. Gout materially diminishes the chances of recovery from acute diseases and injuries.

TREATMENT.—1. *During the Paroxysm.*—It is generally advisable when a fit of gout comes on to give a brisk purgative, such as a pill containing calomel and colocynth, followed by a black draught. *Colchicum* is *the specific remedy* for this affection, but it must be given with care, and not allowed to produce severe purgation or depression. From 10 to 20 minims of *vin. colchici* should be administered every six or eight hours, and it may be combined with the bicarbonate, or some vegetable salt of potash, freely diluted. The salts of *lithium* have been recommended. Some *carbonate of alumina* has lately been sent to me, with the request that it should be tried in cases of gout.

It is desirable to keep up a free action of the skin by the use of diaphoretic drinks, or the vapor or hot-air bath might be employed in some cases. A low diet is generally indicated at first, which should be gradually improved, but it may be necessary to give a good deal of liquid nourishment. As a rule all stimulants ought to be stopped, especially in young persons, but sometimes it is advisable to allow more or less brandy, well diluted. If there is great pain and restlessness, opium must be given at night, in the form of Dover's powder, or subcutaneous injection of morphia may be had recourse to.

As regards *local treatment*, *rest* is of course essential, and an *elevated position* should be adopted. Affected parts should be wrapped up in flannel, or in cotton-wool covered with oil-silk. If the local symptoms are very severe, warm fomentations or poultices containing opium, or localized steaming may be tried; or it may be advisable to apply anodynes, such as belladonna liniment, tincture of aconite, or a solution of atropine or morphia. *Removal of blood is extremely rarely called for*, but sometimes a blister is useful. As the inflammation subsides, it is often desirable to employ gentle pressure, by means of a bandage or elastic stocking, so as to get rid of the œdema and other conditions which are liable to remain; slight friction may also be used.

Should an attack of *misplaced gout* set in, it is requisite to endeavor to excite inflammation in the joints by means of friction, heat, or sinapisms. In the neurotic affections, opium with ammonia, ether, camphor, musk, &c., are the remedies indicated, stimulants being also generally required. External heat or sinapisms are of much use. Inflammations may require the application of a few leeches, or of a blister, but in most cases gouty patients will not bear much depression.

2. *During the Intervals.*—There is no disease in which a careful study of the patient and everything connected with him is more necessary, in order to pursue a proper course of treatment, than in the case of gout. In the early stage a practical cure may be often effected, especially in acquired cases, in so far that no further attacks come on, provided due attention is paid to certain rules. When the complaint is hereditary also, it may be prevented from exhibiting itself, or at all events may be put off until a later period in life, by the exercise of proper care.

Diet requires strict regulation, and must necessarily vary much in different subjects. It should be nutritious and easily digestible, consisting of a due proportion of animal and vegetable matters, but nitrogenized and saccharine substances must not be given too freely. Moderation in eating and regularity of meals are important. Tea and coffee may be allowed. Soft and stewed fruits can be taken, provided they do not contain much sugar; pastry ought to be avoided.

The use of *alcoholic stimulants* is a matter calling for much consideration. In young persons *total abstinence* is to be decidedly recommended, and also in other cases where there is no obvious necessity for stimulants. The nature and quantity of the stimulant to be taken should be always distinctly stated. *Malt liquors and all strong wines* ought to be rigidly denied. Lighter wines, *of good quality*, such as claret, hock, moselle, or chablis, may be allowed in moderation. Freely diluted spirits are also permissible in some cases, either brandy, whisky, or gin, and they may be taken with effervescent mineral waters.

There is one point of importance to be mentioned, viz., that when a change is being made as regards the diet and drink of a gouty patient, it should be carried out gradually, and not too abruptly.

General *hygienic* measures need attention, including *daily exercise in the open air, and the avoidance of sedentary habits;* ventilation; daily bathing, with friction afterwards, and the occasional use of a warm, Turkish, or tepid salt-water bath, in order to keep the skin acting freely; warm clothing, *with flannel next the skin;* the avoidance of excessive mental labor; the avoidance of late hours at night, or remaining in heated and ill-ventilated rooms, and lying in bed too long during the day; if possible, residence in a warm and equable climate, but if this cannot be carried out, all sudden alterations of temperature and exposure to wet must be avoided, and a change to a favorable climate is advisable during the winter months.

It should be mentioned here, that those who work in lead ought to be instructed to take every precaution against the entrance of this metal into the system, as this is so often followed by gout.

The *condition of the digestive organs* must be looked to. The bowels should be kept open daily, if necessary, by means of some mild aperient. Much mercury is injurious, but there is no harm in giving a little blue-pill occasionally. It may be requisite to give remedies to improve the digestion, and relieve portal congestion.

Mineral waters are often useful, but require caution in their administration. Those of Buxton and Bath in this country, and various German waters are recommended, especially those of Vichy, Wiesbaden, Baden-Baden, Aix-la-Chapelle, Carlsbad, Kissingen, Marienbad, Homburg, Ems, Wildbad, &c.

It is scarcely necessary to add that everything should be avoided which is known to be likely to produce an acute attack of gout.

Therapeutic Treatment.—*Colchicum* is a valuable medicine, even between the attacks of gout, when carefully administered; it is best given in the form of *extract* at night, with extract of henbane or gentian, or a few minims of the wine may be added to other medicines. In a good proportion of cases *tonics* are required. *Quinine,* tincture or infusion of cinchona, some form of iron, or mineral acids and bitter infusions, are frequently serviceable. Guaiacum and ammoniacum are strongly recommended for asthenic gout in old persons. Iodide of potassium is sometimes beneficial.

Alkaline and *earthy salts* are valuable in many cases, given freely diluted on an empty stomach, especially the *carbonates* and *phosphates of potash, magnesia*, or *lithia*. They promote the action of the kidneys and other excretory organs. The salts of *lithia* have been specially advocated, the carbonate being given in 5 to 10 grain doses, or the citrate in 8 to 12 grain doses. Most of the mineral waters owe their efficacy to some of these substances being dissolved in them.

Among other remedies recommended are benzoate of ammonia, phosphate of soda and ammonia, lime-juice, &c.

When the joints become much altered but little can be done locally. Friction, shampooing, and pressure might be employed carefully.

Sores require to have some simple dressing applied. A dressing of solution of a potash or lithia salt has been used.

CHAPTER XIV.

SCORBUTUS—SCURVY.

Etiology.—This is a distinct and peculiar disease, and the term "scurvy" must not be applied to various skin diseases, as it sometimes is. It rarely occurs in ordinary practice, but is met with chiefly among seafaring men, and consequently is by far most common in the hospitals of seaport towns. During the early part of my connection with the Liverpool Northern Hospital a large number of cases were admitted within the year, but subsequently they became less numerous, owing to better regulations for the prevention of the disease being carried out.

Scurvy has been attributed to many causes, such as the use of salt meat, or of putrid meat and bad water, or imperfect hygienic conditions, but my own experience would lead me to agree with those who believe that it is always due *to the want of fresh vegetable diet*, or of *some appropriate substitute*. This was invariably the case in connection with the seamen in whom I have observed the disease, and in the only three cases of land scurvy which have come under my notice it could be distinctly traced to the same cause. It must be mentioned, however, that the complaint has broken out under circumstances which seem to indicate that it might possibly arise in other ways.

During the siege of Paris numerous cases occurred, and it has been stated that they were the result of insufficient food and bad hygienic conditions.

With regard to the immediate effect of deficiency of vegetables, all that can be stated with certainty is that it produces some alteration in the composition of the blood. This has been attributed to a want of potash salts, of vegetable albumen, vegetable acids, and various other matters.

Advanced age, a cold and damp climate or season, exposure, fatigue, and despondency, have been set down as *predisposing causes.*

ANATOMICAL CHARACTERS.—In fatal cases there is usually much emaciation, with œdema of the legs. The blood is very dark, and liquid, and its coloring matter stains the tissues. Extravasations are met with in the subcutaneous tissue, as well as between, or sometimes even within the muscles, and they are often coagulated and firm, or partially organized. Serous and synovial effusions occur, especially pericardial effusion, and these are frequently mixed with blood. The organs are loaded with blood, and the seat of ecchymoses and extravasations, being also relaxed and softened. Ecchymoses may be seen under the serous membranes, and the mucous membranes are red and swollen in some parts. Fatty degeneration of the muscles is said to occur. The appearances described under symptoms will necessarily be observed after death.

SYMPTOMS.—It will be best to describe first the conditions met with in a well-marked case.

The *general appearance* is very striking. There is a peculiar unhealthy aspect, the face being sallow and of a dirty-yellowish hue, combined with puffiness about the eyelids and anæmia, which is well seen in the mucous membranes. More or less emaciation exists, but it may not be very great, even in bad cases. The patient complains of languor, debility, sense of fatigue, shortness of breath, faintness, pains and soreness in the limbs, with a feeling of low-spiritedness and despondency. These symptoms vary in degree, sometimes amounting to complete prostration, with a tendency to sudden syncope, which may be fatal.

The *mouth* affords some characteristic signs. The gums are either more or less swollen, turgid, dark, and spongy, sometimes reaching even to the level of the teeth, or they become ulcerated and gangrenous, dropping off in masses, and exposing the teeth or jaws. From the first they readily bleed, and after a time blood oozes constantly from them. The teeth are very tender, so that chewing becomes impossible, and they are soon also loosened, or even drop out. Necrosis of the jaws occasionally occurs. The breath is excessively foul, and its odor is peculiar.

The *legs* present small purple spots, corresponding to the hair-follicles, and being due to extravasations of blood into these. They are chiefly found below the knees, but are not uncommon though less abundant on the thighs, being rarely seen on the abdomen or arms. In addition to these there are more or less extensive, irregular ecchymotic patches, presenting various hues, according to the changes in the coloring matter of the blood. Brawny indurations also exist, due to deeper extravasations of blood, and these are often very painful and tender; they are especially observed in the hams and calves. Œdema of the feet and legs, and desquamation of the cuticle are common. There is much stiffness in movement, which also causes pain, and a constant sense of aching and contusion in the legs is felt.

In some cases hemorrhages occur from various mucous surfaces. Ulcers occasionally arise, or old ulcers may break out anew, or assume an unhealthy aspect, being covered with large bleeding granulations. It is said that old fractures sometimes become disunited, that bones soften, or epiphyses become separated.

This complaint comes on gradually and insidiously, and may be met with in all degrees of severity. I have seen cases admitted into hospital almost in a moribund condition.

Sporadic cases of land-scurvy are less severe than sea-scurvy, according to my experience, but they tend to be more chronic, and much less amenable to treatment.

The *alimentary canal* is usually out of order. The appetite is impaired as a rule, but sometimes patients state they feel inclined for food, but cannot chew, and certainly as soon as they are able to masticate the appetite generally returns. In bad cases nausea and vomiting may be present. Obstinate constipation is the rule, but occasionally diarrhœa exists, and the stools may contain blood, or actual dysentery may be present as a complication. There is no pyrexia. The pulse is infrequent, weak, and small. The patient often passes restless nights. The urine is deficient in quantity, dark-colored in some cases, but by no means always, and tends to decompose rapidly. Urea, phosphates, and potash are deficient. Occasionally blood is present.

Alterations have been described in the blood, but there is no certainty on this matter. Dr. Garrod states that potash is much diminished in quantity. A recent writer—Dr. Leven—has stated that in cases which occurred during the siege of Paris, he found fibrin in excess, and corpuscles diminished by one-half.

DIAGNOSIS.—The only disease likely to be confounded with scurvy is purpura; the diagnosis between them will be pointed out under the latter.

PROGNOSIS.—All the cases of sea-scurvy that came under my notice rapidly recovered, except one, and in that case death resulted from an accidental complication, viz., apoplexy. Therefore the prognosis is very favorable, if proper treatment can be adopted. As already remarked, land-scurvy does not seem to be so easily cured, and in one case acute inflammation of the stomach, intestines, and lungs set in, without any evident cause, ending in speedy death.

TREATMENT.—Scurvy is one of the most satisfactory diseases to treat, if the necessary remedies can be obtained. All that is required is to give plenty of fresh, soft, and succulent vegetables, and to let the patient drink from ℥iv to ℥viij of lime- or lemon-juice daily, and speedy recovery follows, as a rule. It was our plan to allow considerable quantities of potatoes and cabbage. Oranges, lemons, citrons, and other fruits of this class are very valuable. Water-cress, garden-cress, mustard, scurvy-grass, sauer-kraut, spruce, and fir, and various other things, have obtained repute in the treatment of scurvy, and might be tried if lime-juice, &c., could not be procured. It is stated that vegetables act best when uncooked, but ordinarily it is unnecessary to give them in this condition.

Liquid, nutritious food is needed, such as beef tea and milk, often in considerable quantity, and as soon as chewing can be accomplished, meat should be taken. Stimulants are frequently necessary, but should be given carefully, in small quantities. I have known a patient, in a very low condition from scurvy, remain unconscious for a considerable time, after drinking ℥ij of wine. In a few days it is advisable to administer some tonic, such as quinine and iron, which aids recovery by giving appetite and strength, and improving the quality of the blood.

The mouth must be frequently washed out with some dilute antiseptic, of which one of the best for this purpose is Condy's Fluid. Afterwards a mild astringent, such as alum-water, may be used. Constipation is generally a troublesome symptom, and is best treated by enemata. Fomentations may be applied to the painful swellings in the legs. If severe hemorrhages occur, astringents must be given. Any ulcers which exist may be dressed with lime-juice, but they improve rapidly under its internal administration.

Many things have been recommended in the treatment of scurvy, such as salts of potash, solution of various vegetable acids, especially citric, and phosphoric acid. I tried the last in one case, but found it had no effect. Raw meat and seal's flesh have also been employed, it is said, successfully.

The *prevention* of scurvy is the most important point to attend to in connection with those persons who lead a seafaring life. There can be no question but that it can be completely prevented by the use either of fresh vegetables, preserved vegetables, or of proper lime- or lemon-juice, which should be served out daily. Many of the specimens of so-called lime-juice used on board ship, are worthless, some not being of this nature at all. Often only a solution of citric acid is used, and this decidedly does not prevent the disease. Vinegar, and the vegetable salts of potash, have been recommended to be employed freely. It is important to attend to all hygienic and other measures for maintaining the general health of the men, and to avoid undue exposure.

PURPURA.

ETIOLOGY.—Purpura is due to a peculiar unhealthy condition of the blood and tissues, which may probably be produced in many ways, but its causes are not at all clearly defined. It is, however, quite distinct from scurvy. It may depend upon bad hygienic conditions, deficiency of proper food (? vegetables), intemperance, and other lowering agencies; or it may occur in connection with various acute fevers, or in the course of many chronic affections, such as albuminoid disease, syphilis, cancer, Bright's disease, &c. Recently a well-marked case, associated with cirrhosis of the liver, came under my notice, and purpura often accompanies jaundice. Sometimes it is the result of the administration of iodide of potassium. It may come on in persons apparently perfectly well, even in its worst form. Amenorrhœa has been stated as a cause. The old and young are most liable to be affected.

ANATOMICAL CHARACTERS.—Purpura is characterized by rupture of the capillaries, and escape of the blood in various parts. Hence there are petechiæ and ecchymoses on the skin; extravasations into the cellular tissue or muscles, on the surface of mucous membranes, and sometimes on serous surfaces. Some organs may also be the seat of hemorrhages, *e. g.*, the brain, lungs, and pelvis of the kidneys. Various diseases of organs are often found, but these are the cause of the purpuric condition, and not its consequences. The blood may be quite normal, or dark and fluid. The cutaneous capillaries are usually healthy, but there is reason to believe that they have sometimes undergone structural changes. Further observation is needed on this subject.

SYMPTOMS.—Purpura is described as occurring under two chief forms, viz., *purpura simplex*, and *purpura hæmorrhagica*, in the former the hemorrhages only being observed in connection with the skin, in the latter taking place also from mucous surfaces, and sometimes from serous membranes, or into the substance of organs, while the cutaneous hemorrhages are generally more abundant. The skin presents extravasations in various forms, viz., minute points (stigmata), petechiæ, vibices, and more extensive ecchymoses. These occur chiefly on the legs, and may appear in successive crops, each lasting a variable number of days. Their appearance is often favored by standing, which causes the vessels to be distended. From the first pressure produces no effect on the color, which is often bright-red at the outset, but afterwards becomes darker, being purple, violet, or almost black in some cases. The usual changes of color are seen as the extravasations disappear. The spots are generally roundish, and have a well-defined outline at the commencement, but subsequently they gradually fade into the surrounding skin. They are not at all raised, but there is often hardening and swelling of the subcutaneous tissue. Blebs containing sanguineous serum sometimes form under the cuticle, and, in rare instances, the skin becomes gangrenous.

The hemorrhages from mucous surfaces which may be met with are, *epistaxis*, hemorrhage from the gums and mouth, hæmatemesis, melæna, *hæmaturia*, hæmoptysis, and menorrhagia. Rarely bleeding from the ear takes place. Extravasations may also be seen into the mucous membranes, such as the conjunctiva, or that covering the palate, cheeks, or gums. Little blisters containing bloody serum sometimes form on the tongue or cheeks. Extravasation into organs is rare, but death has occurred from pulmonary or cerebral apoplexy.

The *general symptoms* vary much, and are considerably modified by the conditions under which the purpura arises. There are often premonitory symptoms for some time, such as general pains, languor, and debility, but not always. The attack may be ushered in by pyrexia or not, and occasionally paroxysms of a hectic type have been noticed. Pains in the abdomen, epigastrium, loins, chest, and limbs, are often complained of. The digestive organs may or may not be impaired. There is always more or less debility and sense of depression, and in bad cases this becomes extreme, being accompanied with the usual characters of marked anæmia, if much blood is lost, and a tendency to faintness or syncope. The pulse is usually feeble, quick, and compressible. The urine may be albuminous, independently of the presence of blood, and sometimes contains casts.

This affection has a very variable duration, being either *acute* or *chronic*. It usually terminates in recovery if uncomplicated.

VARIETIES.—In addition to those already mentioned, the following are described: 1. *Senilis*, which is met with in old people, owing to degeneration of the vessels, and especially on the exposed and irritated arms of old women. 2. *Rheumatica*, occurring in rheumatic individuals, with much pain. 3. *Urticans*, where *purpura simplex* accompanies urticaria. 4. *Papulosa*, which is merely a form of *lichen*. Petechiæ may occur in connection with many skin diseases.

DIAGNOSIS.—Scurvy is the main disease from which purpura has to be separated. It is only necessary to mention that it might possibly be mistaken for ecchymosis from injury, flea-bites, typhus fever, or the hemorrhagic form of measles. It must also be distinguished from the *hemorrhagic diathesis*.

Scurvy has the following characters to separate it from purpura: 1. The peculiar color and sallowness, which is present even before any hemorrhage occurs. 2. *The state of the gums*. 3. The greater extent of the ecchymotic patches. 4. The presence of brawny indurations in the substance of the limbs, with much pain and stiffness. 5. Extensive desquamation of the cuticle. 6. The great cause of scurvy is the *want of vegetable food*, which is not the case in purpura, and the latter *is not cured or prevented by the use of this diet or of lime-juice*, at all events to any material degree.

PROGNOSIS.—Much will depend on the cause of the disease, especially whether it is associated with any organic affections. The *hemorrhagic* variety is very dangerous, but I have seen recovery take place, apparently spontaneously, when all treatment had failed, and the case had been given up as hopeless. The simple form is often very tedious, and liable to return.

TREATMENT.—In the first place it is necessary to look into all hygienic conditions and improve them if they have been at fault, and to give a nutritious diet, both animal and vegetable, stimulants being also often required.

Rest in the recumbent posture is generally advisable. Attention must be paid to any cachexia present, as well as to any organic disease, on which the purpura may depend. If there is much plethora, saline purgatives may be given at the outset.

The chief remedies recommended for purpura are tincture of iron in full doses, turpentine, tincture of larch bark, and arsenic.

In my opinion the first is most useful, and it may be combined with quinine, and dilute sulphuric acid. In the hemorrhagic form, gallic or tannic acid, alum, ergot of rye, acetate of lead, and other astringents, are to be employed freely, but they often fail. Local astringents, pressure, cold, especially by ice, and other local measures, must be tried, where this is practicable. Careful bandaging of the legs, or the use of an elastic stocking, is advantageous in many chronic simple cases.

CHAPTER XV.

RACHITIS—RICKETS.

Etiology.—The very frequent occurrence of rickets in this country demands for it careful attention and study, and the out-patient practice of any hospital will afford ample opportunities for the observation of this disease. It is unquestionably a *general or constitutional disease*, and can in the large majority of cases be traced to some obvious cause, which leads to imperfect nutrition.

This complaint always sets in during infancy or childhood. The great majority of cases occur during the first or second year. It is *not a congenital disease*, and rarely appears before six or seven months after birth; it may commence as late as seven or even nine years of age. Some believe it is hereditary, but in most instances it certainly is not. Early marriages, intermarriage, and ill-health or advanced age of the father, have been set down as causes, but there is no evidence of this, nor is rickets a mode of development of tubercle or syphilis. A large proportion of cases occur in children *who have been brought up by hand throughout or from an early period, and have been improperly fed artificially.* On the other hand, *prolonged suckling* is sometimes the cause, the milk becoming unfit for proper nourishment, or *too frequent suckling.* The state of health and general nutrition of the *mother* has also a material influence in the causation of this disease, on account of the effect thus produced on the milk, and hence all imperfect hygienic conditions, deficiency of food, chronic diseases, and other agencies which impoverish the blood of the mother, tend to produce rickets in the child, on whom some of them must also have a directly injurious effect. In some instances it appears to depend upon some previous lowering disease, especially gastric and enteric catarrh, with long-continued diarrhœa.

Occasionally a child becomes rickety in the midst of a family, but if one is affected, those who follow generally suffer also. Among the poorer classes it is very common for all the children after the second or third to be the subjects of this disease. It has appeared to me to be far less frequent in country places and small towns than in large towns and cities.

Anatomical Characters and Pathology.—The chief morbid changes in rickets are found in the bones. They consist in an increased growth or proliferation of the epiphyses and periosteum, accompanied with delayed, imperfect, and irregular ossification. As a result, the *ends of the long bones* are greatly enlarged, the flat bones are thickened, *especially at their growing edges, all the bones are softened*, and hence *curvatures and angular deformities* arise, leading to more or less distortion.

The degree of enlargement of the epiphyses varies considerably, and there is much difference in the relative amount of this and of the softening of the bones. They are increased chiefly in breadth, not because the growth is lateral, but on account of the pressure and muscular action to which they are subjected. The layer of cartilage in which ossification normally proceeds is much developed, and the spongy tissue of the bone is increased. Softening exists, and a quantity of red pulp can be expressed, consisting of fat, nucleated cells, and blood-corpuscles.

The shafts of the long bones may be so softened that they can be easily bent, or cut with a knife or scissors; the periosteum is vascular and thickened, owing to the formation of a compact tissue, from which bone is normally produced; and this is especially noticed at the line of junction between the bone and cartilage. Pathologists hold very different views as to the original cause of this softening. Some believe that there is at first an *absorption of the calcareous matter already deposited*, as well as impeded ossification; others are of opinion that there is no such absorption, but that the old bone disappears from within in the ordinary course of things, as in health, but the newly-formed external material does not ossify to take its place. Much red pulp is contained in the medullary canal and the various interstices of the bone.

Some important deviations are observed as regards the mode of deposit of the calcareous matter during the progress of ossification. Instead of there being a tolerably regular line where calcification is proceeding, at the junction of the bone and cartilage, as occurs normally, this is very unequal, the calcareous matter in some parts shooting far up into the cartilage, portions of which may also become completely isolated, and in advanced cases there are often distinct spots of calcification. Some of the cartilage cells are very large, and Kölliker and others describe them as being *directly converted into lacunæ by a deposit in their walls*, canaliculi forming at the same time. Sir W. Jenner states that the calcareous matter is deposited *within the cells*, which may become completely filled, the process in fact being merely one of petrifaction.

Another abnormal condition of importance is, that the medullary cavity passes into or beyond the line of ossification, while distinct spaces form in the epiphyses, which may contain a fibrous, vascular stroma, produced by fibrillation of the interstitial tissues, around which calcification takes place.

The flat bones are similarly altered, being thickened from periosteal formation, especially near their growing edges, as well as softened, consisting chiefly of diplöe containing much red pulp.

The *chemical composition* of rickety bones becomes greatly altered; the organic matter is markedly in excess, being in the proportion of 79 to 21 inorganic, and neither gelatin nor chondrin can be obtained.

Certain obvious changes occur as the result of the altered structure of the bones. The spinal column and long bones are bent and twisted, producing often much deformity. The chest and pelvis are peculiarly distorted. Where a long bone is bent, its medullary cavity is narrowed, and may be ultimately completely closed by callus. Partial or complete fractures are not uncommon, but the periosteum remains uninjured.

The skull is large, its sutures remain long ununited, its fontanelles open, and the bones are especially thickened at a little distance from their edges, so that the sutures appear grooved, with a little elevation outside. In some parts the bones may be thinned, so that the periosteum and dura mater meet.

Should the rickety process subside, the enlargement of the epiphyses diminishes, and they often ossify rapidly, so that growth of the bones in length is interfered with, thus leading to the production of dwarfs. The shafts also become firm, remaining permanently more or less deformed. The head continues to grow, and often becomes very large.

What is the *pathology* of the morbid conditions met with in rickety bones? Some believe the proliferation of the epiphyses and periosteum is primarily inflammatory, and that the resulting disturbance of circulation prevents the deposition of calcareous salts. Others think that the calcareous matters are not supplied in sufficient quantity; and still others, that they are absorbed, or are prevented from being deposited by excess of lactic acid, or some other acid in the blood, which keeps them dissolved, and they are then excreted by the kidneys. Sir W. Jenner is of opinion that there is no deficiency of lime salts, but a malposition.

The tissues in rickety children are relaxed, and wanting in tone, and all structures in connection with bones are arrested in their growth. The muscles become small, pale, and flabby.

Important internal morbid conditions are frequently met with, which can only be enumerated at present. These are: 1. Collapse and emphysema in various parts of the lungs, in connection with the deformed and weak thorax. 2. Bronchial catarrh, extensive bronchitis, or pleurisy. 3. White patches on the pericardium and spleen, due to the distorted chest. 4. Albuminoid infiltration of most of the organs, involving sometimes all the *absorbent glands*, but especially the mesenteric glands. 5. Chronic hydrocephalus, the fluid being either in connection with the membranes, or in the ventricles. The brain is much enlarged, but this is due to albuminoid infiltration, or increase of the neuroglia, and not to true hypertrophy. 6. Gastro-enteric catarrh.

SYMPTOMS.—At the early period the symptoms are often not very definite, and the onset of the disease is insidious. Generally there is marked disturbance of the alimentary canal, with some pyrexia, the pulse being quick and irritable. The child alters in disposition, becoming dull and sad, or peevish and irritable, and is languid, refusing to play or be amused. It may cease to walk, if it has already commenced, or will not attempt to do this. At the same time there is wasting, the tissues becoming flabby, and the face pale. These and other non-characteristic symptoms may be present, but there are three signs which Sir W. Jenner looks upon as pathognomonic. These are: 1. *Profuse sweating about the head, neck, and chest,* especially during sleep, attended with enlargement of the veins, the other parts of the body being often at the same time hot and dry. 2. *General soreness and tenderness of the body,* so that the child cries on being touched, or even on the approach of any one; cannot bear to be washed, and keeps quite still, avoiding every movement. Older children do not suffer so much, but complain of pains in the limbs. 3. *Throwing off of the bedclothes at night, in order to try to get cool.*

At this time the urine may be very copious, and contain abundant calcareous salts or phosphates.

Sooner or later the changes in the bones are revealed, and in out-patient practice it is generally found that these exist more or less when the child is brought to the hospital. The enlarged ends of the bones are distinctly seen or felt, so that the joints seem swollen and knobby, especially those which are least covered; the wrists and ankles are most convenient for observing these characters. Nodules are also felt at the junction of the ribs with their cartilages. The limbs are variously distorted and curved, and also the clavicles, which exhibit two bends; the spine is deformed, as well as in many cases the pelvis and chest. The last will be considered fully later on, but it is impossible to give a description here of the various other deformities met with, which will differ according to the movements carried on, the mode in which the child is supported and carried, the ordinary position assumed, &c., and they will depend upon the age at which the disease sets in. In some cases the enlargement of the joints, in others the distortion of the limbs is most evident.

The *head and face* present well-marked characters. The former is large, has a long antero-posterior diameter, with a high and square forehead, often projecting; the anterior fontanelle remains unclosed much beyond the ordinary period, and in many cases the sutures are open and grooved, with a thickening on each side. In some parts the bone may be very thin, or entirely absent, but this is very rare. The hair on the scalp is generally thin. The face looks small, but broad, and is often turned up, owing to the head being thrown back, or sinking between the shoulders. It assumes a staid, sedate, or pensive expression, and becomes "old-looking."

An important circumstance in connection with rickets is, that *the teeth appear very late*, often none having come through at the end of a year or more, and they also *rapidly decay or fall out.*

The *general symptoms* progress in the course of the disease; emaciation, flabbiness of tissues, debility, and loss of power, are more or less marked, the child being sometimes completely helpless, and unable to sit up or move in the least, the head dropping in any direction. The skin often becomes thick and opaque, and covered with downy hairs. Sweating continues, and the alimentary canal is deranged. Hectic symptoms may set in. All development and growth is arrested, the body remaining short and stunted.

Much difference of opinion exists as to the state of the intellect in rickety children. Many believe that the mental power is improved, but this is certainly not the case, although they may appear to be very precocious, and are often amusing; in some instances they become stupid, and almost imbecile, which may be seen in the expression of the face. Rickety children are late in talking.

The urine is pale and abundant, contains an excess of earthy phosphates and lactates, and sediments of oxalate of lime often form. Urea and uric acid are said to be deficient. Calculi are not uncommon.

During the course of rickets the symptoms of the complications mentioned under the morbid anatomy frequently appear. Among the most common and dangerous are those indicating the presence of bronchitis, or gastro-enteric catarrh. *Laryngismus stridulus* and *convulsions* are also very liable to occur. Death generally arises from one of these complications, but may be due to the cachexia resulting from the disease itself.

When a favorable result follows, the symptoms gradually subside, strength is restored, but usually more or less permanent distortion remains, which, however, may frequently be greatly diminished by appropriate treatment.

All grades of rickets are met with, from the slightest to the most severe cases.

PROGNOSIS.—Rickets may generally be cured, if taken at a sufficiently early period, and treated properly. Its complications are very serious, and the existence of rickets adds much to their gravity, especially in the case of chest-affections. The thoracic and pelvic deformities which it produces are very injurious.

TREATMENT.—The first thing to attend to is the *dieting* of the child, which is almost always at fault, and about which thorough inquiry should be made, with the view of correcting anything that is wrong. The breast should only be taken at *regular stated intervals, and for a certain time*, or the child should be weaned, if suckling has been too long-continued, or may be partially artificially fed. Often the mother's health requires attending to. The feeding of children artificially needs the greatest care in this disease. *Milk with a fourth part of lime-water* constitutes the most important article of diet, to which may be added a little cream and milk-sugar. These must be given in *regulated quantities*, and the feeding-bottle should be kept scrupulously clean. It is a common custom to give young infants considerable quantities of arrowroot, corn-flour, and various artificial foods of a farinaceous character, and these certainly do more harm than good. Ass's milk and goat's milk are useful, if they can be obtained. For older children, beef tea, eggs, and milk-puddings are valuable, and later on they may have *pounded* meat, or be allowed to suck a large piece of under-done beef, or have the juice pressed out of this. Potatoes well mashed with gravy may also be given. All indigestible substances must be avoided.

Hygienic management also requires much attention. The ventilation of the bedroom must be looked to, and the child should have a separate bed, if possible, kept very clean and dry. After the early symptoms have subsided, the child should be much out of doors whenever weather permits, in the sun, a dry bracing air of moderate temperature answering best. The clothing must be sufficiently warm, and the common custom of exposing the lower part of the body ought to be avoided. A change to the seaside is very beneficial. The body should be washed over twice a day with warm water; and, later on, warm salt-water bathing, with friction afterwards, is useful. It is important to look to the position assumed by the child, and to the movements carried on, so as to prevent deformity. Splints to the legs are of use, to prevent them from being put to the ground. The abdomen should be bandaged. Any distortion of the limbs must be removed, as far as possible, by systematic efforts to straighten them.

Therapeutic Treatment.—It is almost always necessary to treat the alimentary canal, as this is usually out of order. Rhubarb, with carbonate of soda, magnesia, or chalk, answers very well, and an occasional dose of castor-oil may be given. Gray powder is useful now and then, when the stools are offensive, but should not be administered as an habitual thing. Lime-water also improves the state of the stomach and bowels. Alkalies and bitters are recommended by some practitioners. At a later stage the two great remedies are *cod-liver oil* and some preparation of *iron*, care being taken that the limbs are straight before these are administered. The former should be given after meals. It may also be rubbed into the arm-pits, and a flannel moistened with some of it be worn over the abdomen. The best preparation of iron is *steel wine*, but others are useful, especially the tartrate, ammonio-citrate, magnetic oxide, syrup of the phosphate or iodide. Chalybeate waters may likewise be given. Sometimes it is advisable to combine quinine with the iron.

When any inflammation arises in rickety children, lowering measures are not borne, but supporting treatment is indicated. Laryngismus requires tonics. The slightest sign of any bronchial catarrh ought to be attended to immediately, as rickets renders this complaint very dangerous, and it aids materially in producing deformity of the chest.

CHAPTER XVI.

CONSTITUTIONAL SYPHILIS.

In its early stage, syphilis does not come within the province of the physician, but its constitutional effects are frequently brought under his notice, and require his attention.

In the present chapter it is proposed to give, first, an outline of the course of the affection, as it results from *direct inoculation*, and then to consider the characters presented by *congenital syphilis.*

Constitutional Syphilis from Direct Inoculation.—Syphilis is classed by many along with the acute specific fevers, the differences observed being supposed to be due to its longer duration. As a primary disease, it can only be transmitted from one individual to another by *direct inoculation or contact.* This produces a *specific sore* with a very indurated base, though but little tendency to suppuration, the neighboring lymphatic glands being also hard, and somewhat enlarged. Then follows a *period of incubation*, of one to three months, at the close of which *secondary symptoms* arise. These are preceded and accompanied by some general disturbance indicated by languor, pains in the bones and joints, especially at night, debility and loss of flesh, slight pyrexia, impaired digestion, anæmia, &c. They consist of: 1. A *cutaneous eruption* of very variable character, being either a mere rash, papular, scaly, vesicular, pustular, bullous, or tubercular. It usually presents a coppery tint, and is most marked in the bends of the limbs. 2. *Ulceration of both tonsils*, the ulcers being gray, abruptly cut, scarcely painful, and without any tendency to spread. 3. *Enlargement of the glands of the neck*, especially behind. 4. *Superficial inflammation* of the mucous membrane of the mouth, tongue, palate, pharynx, or larynx, with sometimes slight ulceration. 5. *Mucous tubercles* or *condylomata* in connection with the tongue, angles of the mouth, pharynx, larynx, anus, &c. 6. *Loss of the hair*, which becomes dry and thin. 7. *Onychia.* 8. *Iritis*, or *retinitis*, these occurring rather late. 9.

Sometimes slight and transient periostitis, especially on the cranium. More or less of these may be present, and this stage lasts from six to twelve months usually, but may in rare instances go on to eighteen months or longer. An important character in connection with the secondary lesions is, that they show a *remarkable tendency to symmetry.*

Then succeeds a period differing greatly in duration in different cases, during which there are either no symptoms at all, or only occasional slight cutaneous eruptions, or little ulcers on the tongue or lip. This is followed by *tertiary symptoms* or *sequelæ.* At this time the chief pathological tendencies of syphilis are to produce certain lowly organized growths of the nature of fibro-plastic, fibro-nuclear, or fibroid tissue, which are prone to suppuration and ulceration.

Many growths are met with in tertiary syphilis which are merely proliferations of ordinary connective or fibrous tissue, and present the same characters, but those which are peculiar to syphilis constitute what are termed *gummy tumors* or *gummata;* there is, however, no marked line of demarcation between these, both often existing together, and the former becoming converted into the latter. These gummata are not of the nature of an *exudation,* but are the result of hyperplasia of the connective-tissue elements previously existing, beginning in the walls of the vessels, and they invade the normal tissues, being mixed up with them or displacing them. At first they are soft, translucent, grayish-white, almost homogeneous, but afterwards become firmer, tough, yellowish, opaque, non-vascular, and caseous-looking, owing to degeneration and gradual drying up. On section they often present a central yellowish mass, or several spots surrounded by a translucent fibrous layer, sometimes looking like a capsule, but this cannot be separated from the surrounding tissues, into which it gradually passes. They vary much in size, and some of the larger masses seem formed by the union of smaller nodules. In structure they resemble at first granulation-tissue or embryonic connective-tissue, consisting of an amorphous matrix with minute spherical or ovoid finely granular cells containing obscure nuclei. This matrix becomes fibrillated more or less, while many of the young elements degenerate and break down, forming at last merely granules of fat and cholesterin imbedded in a small amount of fibrillated stroma. These several stages may be seen in the same growth, the central, yellowish portion of the nodule being that which is most advanced. A few vessels are present in the recently formed tissue, but these afterwards disappear.

These growths may be absorbed more or less completely, or their fibrous stroma may be left, which tends to shrink, forming deep cicatrices, seams, &c. They are liable to suppuration or ulceration, as before stated, when in certain structures. Many tissues and organs are often affected at the same time, which is one of the great characteristics of syphilitic deposits, and they lead to serious interference with their functions. Allusion will again be made to these morbid changes when treating of the diseases of the several organs.

The chief morbid conditions associated with the *tertiary stage* of syphilis may be enumerated as follows: 1. *Skin eruptions and ulcerations*, viz., erythema and psoriasis of the hands and feet; ulceration from tubercles, subcutaneous gummata, or syphilitic lupus. These ulcers are horseshoe- or kidney-shaped, and spread in a serpiginous manner. 2. *Ulceration of the pharynx and palate.* The ulcer may commence at any point, often in two or more places. It is unsymmetrical; spreads very irregularly and deeply, causing much destruction of tissue, and forming an excavation with hard borders. It often extends to the larynx, producing very dangerous symptoms. In some instances it reaches the œsophagus. When cicatrization takes place, there is often much induration and contraction, which may lead to obstruction. 3. *Induration of the tongue*, followed by hard, well-defined, unhealthy, painful ulcers. 4. *Ulceration of the rectum* occasionally is met with, accompanied with dysenteric symptoms, and it is very apt to be followed by stricture. 5. *Growths in*, or *ulceration of the larynx*, the latter almost always beginning on the epiglottis, and presenting the usual characters. Its cicatrix is firm, pink, shining, and retracted, with growths around, and hence causes great interference with breathing, &c. The cartilages often necrose. The trachea and large bronchi may be the seat of fibroid thickening, leading to diminution of their calibre. 6. *Gummata in the subcutaneous tissue* or "cellular nodes," most frequent among females, and generally observed on the legs, being single or multiple. They finally form ulcers. 7. *Inflammation of a bursa*, especially that over the patella, followed by ulceration. 8. *Gummata in the voluntary muscles and heart.* In the former they often form indurated tumors. 9. *Periostitis and disease of the bones.* Periosteal "nodes" form chiefly on the tibia and skull, sometimes in large numbers, but they may be almost anywhere. They are usually attended with severe pain, especially at night, and soreness. They may undergo absorption, ossification, fibrous development, suppuration, or may become truly gummatous. Bones are often carious or necrosed, portions being exfoliated and leading to much destruction of parts. This is frequently seen about the nose, palate, and skull, and may originate intercranial inflammation. I have met with several instances in connection with the ribs, leading to pleurisy. Syphilitic caries presents a peculiar wormeaten appearance. 10. *Syphilitic enlargements of the testicle* sometimes occur from deposit in it. 11. The *lymphatic glands* may be chronically enlarged, but exhibit very slight tendency to suppuration. 12. The *internal organs* are not infrequently affected, especially the *liver* and *nervous system*, from the formation of gummata or fibrous growths. These will be treated of under their respective chapters. *Albuminoid disease* and *fatty degeneration* are also frequent results of syphilis. 13. The *placenta* becomes often the seat of the usual growth, and, as a result, abortion or miscarriage takes place. This may also happen from the direct effects of the syphilitic poison on the ovum.

These different morbid changes are accompanied with more or less constitutional cachexia, and they necessarily produce various local symptoms, according to the part affected. A prominent distinguishing feature between the secondary and tertiary stages of syphilis is, that in the latter there is no tendency to symmetry.

Congenital or Hereditary Syphilis.—Syphilis in the infant is occasionally evident at birth, and various internal lesions may occur while in utero; but more commonly it is not revealed before from three weeks to a month or two after birth, very rarely as late as six months. The *appearance* is usually highly characteristic. There is great emaciation, with anæmia, all fat having disappeared, while the muscles feel flabby, the skin hangs in loose folds, and growth is retarded. The *face* has a peculiar, shrivelled, aged, decrepit look, which is particularly seen when the child cries, which it often does, being very fretful. Its aspect is dark, opaque, earthy, or muddy. The nose is often broad. The skin generally feels dry, harsh, rough, and inelastic, and the cuticle desquamates. Various *cutaneous eruptions* occur, which tend to be moist. Among the most frequent is a dull red or coppery, shining, erythematous condition of the palms and soles, of the surface around the anus, and of the thighs and genitals. These parts should always be looked to. Roseola, lichen, psoriasis, eczema, impetigo, ecthyma, or pemphigus may be present. Small yellowish patches may form on the skin like hard scales, which, on separating, leave superficial ulcers. The hair is often very deficient, and the nails grow slowly, while ulceration takes place in connection with them. The *mucous membranes* always suffer, being either inflamed, or the seat of tubercles or condylomata, or ulcerated. The mouth is hot and swollen, and the lips fissured. A *peculiar hoarse cracked cry* generally exists, with "snuffling" and nasal discharge, which tends to clog the nostrils and interfere with breathing. These are very important symptoms. Ulcers may be seen in the nose, angles of the mouth, on the lips, in the throat, about the anus, &c. *Mucous tubercles* are generally observed about the mouth and anus, but may be on the labia, scrotum, near the umbilicus, or in the larynx. Condylomata are sometimes present. Discharges from the eyelids or ears are not uncommon. Sometimes iritis occurs, or other inflammation of the eye. Syphilitic children are more liable to serous inflammations than others. Nodes very rarely appear, but are apt to be numerous. The internal organs may be affected. In exceptional cases there are well-marked evidences of congenital syphilis, without any particular emaciation or anæmia.

Mr. Hutchinson calls attention to some important distinctions between *congenital* and ordinary *constitutional* syphilis. He says that in the former the secondary and tertiary phenomena sometimes occur together, but the secondary are not then well marked; as a rule, however, there is a considerable interval between them, the child apparently recovering more or less completely, and tertiary symptoms not setting in until from five years of age to the time of puberty, or even later. In the meantime the health may be good, but there is scarcely ever an appearance of good health, and growth and development are sometimes much retarded. As special secondary symptoms, he mentions *diffuse stomatitis without ulcers* and *diffuse inflammation of the mucous membrane of the nares.* Among tertiary symptoms are included a *form of phagedenic lupus* and *interstitial inflammation of the cornea* or *keratitis.* Deafness and amaurosis are also stated to be far more common in the *inherited* disease, but paralysis of single nerves is not observed. Another point of difference is that in all its stages congenital syphilis tends to exhibit symmetry.

The *teeth* are sometimes affected in congenital syphilis. The incisors of the temporary set are cut early, but are of bad color and crumble away speedily, especially the upper central. The same teeth of the permanent set are of a bad color, short, narrow, peggy, and deformed, rounded at the angles, separated by an interval, or looking towards each other, the edges being jagged or having a vertical notch, with sometimes a shallow groove running up to the gum in front and behind. Sometimes the canines are affected.

It has lately been suggested that the virulent character which scarlatina sometimes assumes in individuals or in families during a mild epidemic, may be the result of a syphilitic taint.

There are certain points with regard to the transmission of syphilis which it is necessary to allude to. It seems certain that it may be communicated to the mother *through the fœtus,* usually only tertiary symptoms being then produced, and these are not severe. There is reason to believe that the disease may be transmitted to a third generation. Probably it may be produced by the milk of a syphilitic nurse, and some believe that, on the other hand, a child may give it to the nurse. The question whether vaccine virus may convey syphilis has been already considered.

DIAGNOSIS.—It is not intended here to enter into the diagnosis of the various lesions which occur during the course of syphilis. Some of these will call for notice in other parts of this work. At present only a few remarks will be made about the general diagnosis of constitutional syphilis, whether resulting from inoculation or hereditary transmission. It is important to insist upon the necessity *of always suspecting the existence of a syphilitic taint,* and in any doubtful case *to make rigid inquiry in order to clear up this point.* If direct information cannot be obtained, it may often be procured indirectly by asking about the ordinary secondary and tertiary symptoms of syphilis, such as sore throat, rash, &c. Examination of the throat, mouth, tongue, eyes, or over the tibiæ or skull, may give evidence of past or present disease in the form of cicatrices, iritic adhesions, nodes, &c. The existence of *paralysis of a single nerve,* especially *one of the cranial nerves,* is strongly indicative of acquired syphilis. Nocturnal pain is also a suspicious sign. In not a few cases the *effects of treatment* give evidence of the presence of the disease.

Inherited syphilis in its advanced period may be recognized in many instances by pallor and an unhealthy aspect; arrest of growth or development; a sunken bridge of the nose; the peculiar teeth or the early loss of the temporary set; pits and scars on the skin, about the angles of the mouth, &c., or actual ulcers; keratitis or its remains; double deafness without otorrhœa, or amaurosis; periosteal nodes or their remains; a prominent forehead as the result of arachnitis.

TREATMENT.—For constitutional syphilis the two great remedies we possess are *mercury* and *iodide of potassium,* the former being especially valuable during the secondary stage, the latter during the tertiary. Mercury may be introduced into the system by the mouth, by inunction, or by the bath, and it is in many cases requisite to bring the patient rapidly under its influence, of course due care being taken against the production of any injurious effects. Calomel, blue pill, bichloride of mercury, and iodide are the forms in which it is usually administered, and the last is often very beneficially combined with iodide of potassium in the later stages. Local applications of ointment or blackwash are valuable in many cases.

Iodide of potassium should be given at first in doses of 5 grains three times a day, and then gradually increased to 10, 15, 20, or even 30 grains in some instances. It is often usefully combined with decoction of cinchona, and some recommend the addition of ammonia.

For fuller details about these and other drugs reference must be made to surgical works.

It is often of great importance to attend to all measures for improving the general health in tertiary cases.

Congenital syphilis decidedly requires mercury. It may be given directly as hyd. c. cræta, gr. ½ ter die, mixed with a little magnesia or chalk, or the ointment may be rubbed into the armpits and thighs, or the milk may convey it, blue pill being given to the mother or nurse, or the milk of a mercurialized goat being employed. At the same time all *hygienic matters* must be properly carried out and the child be carefully fed. *Cleanliness* is essential, and simple local applications are often necessary, or blackwash. Toilet powder should be freely used over the seat of eruption. The use of cod-liver oil, either internally or by inunction, frequently does good.

In the advanced stage of congenital syphilis mercury often disagrees very much, and at the early stage it sometimes cannot be given. Iodide of potassium must then be substituted.

CHAPTER XVII.

TUBERCULOSIS AND SCROFULOSIS.

THERE is no subject about which it is more difficult to give a concise account at the present time than that of the so-called tubercular affections, there being such different views as to their pathology, and, indeed, even as to what is meant by *tubercle;* while many believe in the identity of the *scrofulous* and *tubercular* diseases, others consider them entirely distinct.

ANATOMICAL CHARACTERS.—It is but too common to hear all kinds of morbid products spoken of as "tubercle," which have no relation whatever to this material. A large proportion of pathologists at the present day recognize but one form of tubercle, which exists as little *gray granulations;* but others still describe two forms, the *gray* and the *yellow*, the latter being either supposed to result from a change in the gray, or to have been originally formed as such.

Gray Granulations, or *Miliary Tubercle.*—About this form all are agreed. It appears as small nodules or granulations about the size of a mustard or millet seed, generally roundish, but sometimes slightly angular, well defined, firm, of a grayish-white or pearly-gray color, more or less translucent, and non-vascular. These may be quite separate and distinct, or collected into irregular groups, their individual outline being then indistinct. Some describe gray tubercle as forming extensive infiltrations which present a smooth and dense section, but these are probably inflammatory in their origin.

Yellow tubercle is said to form either small nodules or masses of considerable size, the result of coalescence. It has a dull yellowish color, varying in exact tint, is opaque, friable, and possesses a more or less cheesy consistence and aspect. That this *yellow tubercle* is not an original product is certain. It is either derived from the *gray granulations which have undergone a process of caseation*, or from *various inflammatory or other materials* which have passed through this change.

Microscopic Structure.—The gray granulations present the following histological elements: 1. Cells which are somewhat irregular and angular, but approach the round or oval form, transparent or containing a few minute granules, and some of them having one or more nuclei. They vary considerably in size, and many of them are looked upon by some pathologists as being mere nuclei, others as compound cells. 2. A substance in which these cells are contained, which is generally homogeneous and hyaline, or granular, but may form a network of very delicate fibres. In many cases the tubercle appears almost completely to be made up of cells crowded together. As it undergoes degenerative changes the cells shrink and break up, while granules, oil-particles, and cholesterin appear in abundance, there being ultimately nothing but a fine granular débris forming the chief portion of the so-called *yellow tubercle.* The different parts of a gray granulation present different characters, the cells being most evident at the circumference, while the granules occupy the central part which has undergone degeneration. When the tubercles become aggregated, the elements of the tissue which they involve are mixed up with their own elements, and small vessels are seen between them belonging to the tissue, and also pigment.

Tubercle frequently exists as a secondary product in connection with caseous masses resulting from degeneration of inflammatory and other formations, and its characters will be modified accordingly. Further it tends itself to lead to inflammation by irritation.

Changes and Terminations.—Some very important changes occur in connection with tubercle. 1. *Absorption.*—That absorption may take place of materials usually considered tubercular there cannot be the least doubt, and it is probable that this may happen with true tubercle, but only after it has undergone the alteration next noticed. 2. *Caseous Degeneration.*—This change is prone to occur rapidly in connection with tubercle, owing to its want of vitality. It begins in the centre of the granules as before stated, and causes them to become yellow and opaque. Ultimately it generally produces such a degree of softening as to convert them into a purulent or curdy-looking fluid, simulating an abscess; or they form a firm cheesy mass which may become encapsuled. 3. *Calcification.*—Having undergone caseation, calcification frequently follows, and the substance consequently becomes inert. Sometimes the calcareous matter is subsequently discharged, or it becomes encapsuled. 4. *Elimination and its results.*—After the process of softening has been completed, elimination frequently follows, provided this can be effected, and as a result ulcers are observed in mucous membranes, and cavities in organs. This is well exemplified in the case of the intestines and lungs. These may ultimately heal up and a permanent cure result. 5. *Fibroid Change.*—There is sometimes an increase of the fibrillated stroma (perhaps more frequently than is generally believed), coincident with the disappearance of the cells, and finally the granulation may consist almost entirely of fibrous tissue, becoming dense and hard. This is probably identical with the change which has been described as *cornification* or *obsolescence*, in which the tubercle becomes opaque, horny, and bluish-gray.

Organs Affected.—Tubercle may be met with in any vascular structure, and may affect several organs or tissues at the same time, but in adults is often confined to one. In *acute tuberculosis*, gray granulations are seen throughout almost every organ in the body. Parts actively growing are chiefly affected. Its most frequent seats are the lungs, larynx, bronchial, mesenteric, and other glands, small intestines, pleura, peritoneum, pia mater, spleen, &c. Its characters in connection with some of these will be again considered. Louis stated as a law, that if tubercle exists after fifteen in any part of the body, it is certain to be present in the lungs.

PATHOLOGY.—The view almost universally held until within a comparatively recent period, and which is still entertained by many eminent observers, is that *tuberculosis is a peculiar constitutional or diathetic disease, which leads to the deposit of a special substance in the tissues, viz., tubercle, this being originally a fluid exudation from the bloodvessels which by its coagulation forms a molecular blastema, the molecules aggregating together to form cells.* Many pathologists totally ignore the constitutional nature of tubercle. Some regard it as merely a retrograde metamorphosis of pre-existing structures, tissue-elements, or morbid products. Virchow and his followers believe that there is an excessive proliferation of cells in a part due to inflammation, which, after partial organization, die, break up, and shrivel.

At present an opinion widely held is, *that true tubercle is the product of an infectious disease, being the secondary result of the absorption of cheesy morbid products into the blood, which somehow act as a poison and give rise to a specific inflammation.* Experiments made by Villemin, Lebert, Wilson Fox, Clark, Burdon-Sanderson, Cohnheim, and others, have shown that bodies resembling miliary tubercle are produced in the lungs, glands, &c., of animals (especially the guinea-pig), by the inoculation of tubercular matter under the skin, as well as of various other morbid products, by the insertion of putrid meat, or by putting a seton in the skin. These tubercles are associated with very numerous inflammatory growths which rapidly becomes caseous. These experiments are supposed to support the infective theory, but some deny that the morbid appearances thus produced have any analogy with tubercle. Those who believe in this theory, consider that many of the materials usually described as tubercle are not at all of that nature, and they regard the *gray granulation* as the only true form.

Acute general tuberculosis often follows some local lesion, especially where caseous matter exists. An adult patient recently at University Hospital afforded a striking example of this. The same is often true of localized tubercle, *e. g.*, in the lungs or glands, but in many instances no such previous morbid condition can be detected, and then the tubercle must be looked upon as *primary.*

Niemeyer thought that the caseous matter produces tubercle by a *local influence* through the lymphatics, rather than by a *general infection.*

Recent observers consider that tubercle can only originate in connection with the so-called "adenoid" or lymphatic tissues. It is most common in the peri-vascular sheaths of the small arteries, the cells of which increase at separate points and compress, or even ultimately close the vessels. It arises also in the lymphatic tissue of the glands and spleen, near the minute bronchi, under the mucous membrane of the alimentary canal, and beneath the epithelium of serous membranes.

ETIOLOGY.—*Predisposing causes.* Looking upon tuberculosis as a *constitutional* disease, it has almost universally been considered *hereditary.* Undoubtedly various forms of tubercular disease run in families, but many think that only a *constitutional debility* is transmitted, with a tendency to low inflammations, the products of which rapidly become caseous, and thus may lead to tubercle. This is the view strongly expressed by Niemeyer, and he believed that the same result would follow in the case of children born of parents debilitated from any cause. Occasionally tubercle is congenital. Intermarriages, very early marriages, and advanced age of the father, have been set down as causes of inherited tuberculosis. *Age* has an important influence both upon the occurrence of tubercle and its seat. It is by far most frequent among children and young persons. Most deaths occur from twenty to thirty. In children the disease tends to involve a number of organs; in adults it is more localized. The *glandular system* is very frequently affected in the former.

A large number of causes which conduce to lower the state of general health act as important predisposing causes of tuberculosis. An enumeration of the principal must suffice, which are imperfect ventilation, want of fresh air, and close confinement; overcrowding; want of exercise; humidity of atmosphere; bad, insufficient or indigestible food, including the milk of mother or nurse; intemperance; interference with the free expansion of the chest, due to clothing or occupation; previous diseases, such as measles, hooping-cough, or fevers, as well as many chronic diseases; long-continued dyspepsia; prolonged lactation; excessive sexual indulgence; excessive mental labor and depressing passions.

Many of these are frequently found acting together, especially among the poor and hard-worked inhabitants of large towns. Imperfect hygienic conditions and improper diet particularly affect children injuriously.

It is believed by some that tuberculosis is infectious through the medium of the breath and exhalations, but there is no foundation for this idea. Nor is there reason to think that it is transmitted by vaccination.

The question of the *exciting causes* has been already considered under the *pathology*. Those who regard *tubercle* as a primary exudation, depending on a constitutional state, believe that any active congestion of a part leads to its formation.

SYMPTOMS.—Much difference of opinion has existed as to whether the *tubercular diathesis* is indicated by any characteristic signs. Many persons become tuberculous who present no evident peculiarities, but the following characters are looked upon as showing a tendency to the disease in children and young persons. They are tall, slim, erect, and delicate-looking, with scarcely any fat, and have usually a pretty oval face, and a clear complexion. Their eyes are bright, with large pupils. The skin is very thin, soft, and delicate, and through it bluish veins are seen; the hair is fine and silky, often light, the eyelashes being long. They cut their teeth early, and are generally precocious, walking and talking soon. They are excitable, and active in body and mind, exhibiting much cleverness. The ends of the bones are very small and firm, the shafts also being thin and rigid, while the cartilages seem very soft and flexible. The *thorax* is small, being either alar, flattened, or pigeon-breasted.

In accordance with these characters, the *strumous diathesis* presents the following. The body is short, thick-set, and heavy; the face pale, unshapely, with expanded and thick alæ nasi, a low forehead, a large upper lip, and a dull, pasty complexion. The skin is thick and opaque, and is very subject to obstinate eruptions. Scrofulous children are inactive in mind and body, and this is shown in the indolence which they exhibit in their expression. The bones are thick, with rather large ends, and are liable to caries. The teeth often decay early. Derangements of the alimentary canal are frequent, and the belly is generally tumid. The lymphatic glands usually become enlarged, and are prone to suppuration. Catarrhal inflammations of mucous membranes are very frequent, evidenced by ophthalmia, nasal discharge, otorrhœa, &c., and catarrh of the alimentary or respiratory mucous tract is common. Tubercle is liable to be produced in connection with this diathesis.

Most of the characters mentioned have been taken from Sir W. Jenner's description.

When tubercle affects any part as a chronic disease, it necessarily produces local symptoms, and also much general disturbance as a rule, in the way of fever, emaciation, debility, anæmia, night-sweats, &c. These will be considered when treating of the individual diseases of organs.

Acute Tuberculosis.—It is necessary briefly to allude to the symptoms which indicate the deposit of tubercle as an acute affection. As a rule, almost all the organs in the body are involved, but only the lungs and brain usually show any local signs, and these are often very obscure.

Three forms have been described, the *insidious*, *acute febrile*, and *pneumonic*, but all grades are met with, and the duration and course of the disease are very variable. At first there may be merely languor, heaviness, irritability, or restlessness, with derangement of the digestive organs, offensive stools, irregular fever, the temperature being sometimes very high, and rapid wasting. Or repeated rigors occur, followed by high fever, with an extremely rapid pulse, much constitutional disturbance and prostration, and abundant sweats. Head symptoms are severe, and there is a great tendency to adynamia, with a dry, brown tongue, sordes, a feeble pulse, &c. Breathing is very hurried, and there may be some cough, but no marked physical signs exist in the lungs. Ultimately, evidences of the presence of tubercle in certain structures often appear, in the form of tubercular meningitis, peritonitis, &c.

DIAGNOSIS.—When examining children, one of the first things to determine is whether they are the subjects of any special diathesis. The characters of the four *diatheses*, viz., the rickety, syphilitic, tubercular, and scrofulous, have been described, and reference to these descriptions will show in what they differ. The existence of tubercle in a part is indicated usually by local symptoms, as well as by constitutional disturbance.

Acute tuberculosis is by no means always easy to diagnose; it may closely resemble fevers, especially typhoid. It should always be remembered in obscure cases occurring among children. The absence of the peculiar symptoms of the fevers, or of any eruption, the range of temperature, extreme frequency of the pulse, very quick breathing, severe and rapid course, and local symptoms present, will usually enable the diagnosis to be made.

TREATMENT.—When there is any tendency to tubercle all hygienic conditions should be rigidly carried out. Fresh air, sunlight, exercise, warm clothing, change to the seaside with salt-water baths, nutritious diet carefully regulated, with plenty of good milk, and the avoidance of mental labor, are the chief things required. The digestive organs must be kept in order, and all sources of irritation at once removed. Every cause likely to lead to chest affections must be carefully avoided, and it will be well to examine the chest from time to time, and to treat the slightest pulmonary complaint immediately. *Cod-liver oil* and *steel wine*, properly administered, do a great deal of good in these cases. The treatment of local deposits will be again considered. In acute tuberculosis nothing is of much avail, but quinine in full doses, cold externally, and ice to the head, might be tried, with supporting diet and stimulants.

speedily disappear, and the fibrous stroma is greatly in excess, especially towards the centre of the growth, where at last no cells at all can be discovered. In *encephaloid*, on the other hand, the cells are greatly in excess, develop rapidly, and as speedily degenerate, becoming granular, and the nuclei being set free. There is but little stroma, which is soft, delicate, and very vascular. *Colloid* is in great part structureless, but some cells are present, large and spherical, often having a lamellar outline, and containing some of the colloid material. *Epithelioma* has generally a large number of cells, which, with few exceptions, are exceedingly like those of squamous epithelium, but are subject to great alterations in shape from pressure. They tend to form peculiar *concentric globes*, or *nests*, increasing from within, so that the outer layers are hardened and flattened. Ultimately, the entire groups may become dry, firm, and brownish-yellow. A variable amount of stroma is present.

Cancerous growths are very liable to *fatty degeneration*, especially the softer forms, and as a result the cells become more granular, and softening occurs, or parts may assume a caseous appearance. Calcification is very uncommon. *Melanosis* and *colloid* are generally considered as cancers which have degenerated. All cancers tend to ulcerate, the ulcers have no disposition to heal, but being, on the other hand, inclined to spread.

Organs and Tissues Affected.—*Scirrhus* is usually observed in the mammary gland, uterus, stomach, rectum, or skin. *Encephaloid* affects chiefly the bones, testicles, eyes, and internal organs, especially the lungs, liver, kidneys, brain, spleen, &c. *Colloid* particularly involves the stomach, but sometimes is seen in the omentum, intestines, and other parts. *Epithelioma* grows in connection with the skin or a mucous surface, but by extension it may invade upon any tissue. Its ordinary sites are the lower lip, the tongue, eyelids, cheeks, scrotum, prepuce, labia, uterus, or bladder. In exceptional cases, internal organs are involved.

More than one part may be attacked, either at the same time, or usually in succession. In the latter case, the original deposit is said to be *primary*, and those which follow are named *secondary*. Secondary deposits are frequent in internal organs, and are generally of the same variety as the primary growth, but scirrhus is often followed by encephaloid in internal organs. Cancers, in the great majority of cases, show a marked tendency to spread, and infiltrate surrounding tissues, so that no line of demarcation is observed; in rare instances a kind of capsule forms.

PATHOLOGY.—This subject is too extensive to be considered at any length. It must suffice to state here that two very opposite views are entertained as to the origin of cancer, viz.: 1. That it is primarily a *constitutional or blood-disease*, or *cachexia*, of which the formation of cancer is but a local manifestation. 2. That it is in the first place a *local disorder*, produced by some irritation, and that the blood is only changed secondarily, as the result of absorption of matter from the local formation. It is not at all improbable that both these theories are correct, in different cases. *Secondary growths* arise as the result of absorption by the blood-vessels and lymphatics, by which the cancerous matter is conveyed to distant parts, especially those more immediately associated with the organ first affected; neighboring absorbent glands are very liable to be involved.

The cells of cancer are developed by the proliferation of pre-existing cells, some think only from epithelial structures, but others believe that they are also derived from connective-tissue corpuscles, and migrated white blood-corpuscles. The *stroma* consists partly of the original cellular tissue, but is chiefly derived from hyperplasia of the connective-tissue elements.

ETIOLOGY.—Cancer is decidedly a *hereditary* disease. *Age* exercises considerable influence upon its occurrence, nature, and seat. It is rare in the young, being far most common after middle age. If it occurs at all, the softer varieties are met with in early life. Cancer is chiefly observed primarily in organs which have been functionally very active, but whose functions have ceased to be performed. The mortality increases as age advances.

Women suffer more than men, on account of the frequency with which the uterus and mammæ are attacked. The digestive organs, bones, and skin are most affected in males.

Anxiety, mental distress, and a depressing climate seem to act as predisposing causes. Injury or other irritation may act as an *exciting cause* of a local growth, and, as already stated, some consider the disease essentially local in its origin.

SYMPTOMS.—Cancer usually produces two sets of symptoms, viz., *general* and *local.* The *general symptoms* include wasting, a peculiar sallow cachectic look, with a yellowish earthy tint of countenance, a careworn gloomy expression, debility and languor, anæmia and its results, irregular fever, &c. These vary much in their intensity, according to the part affected, the rapidity of growth, and the nature of the cancer, being most marked in scirrhus.

The *local symptoms* include subjective sensations of pain and tenderness, or rather sensations, often very severe; interference with the functions of the part affected, frequently of serious moment; symptoms due to pressure on neighboring structures; and the "physical signs" afforded by the growth itself. The pain tends to be of a lancinating or burning character.

The duration of cancer cases is very variable, but is rarely prolonged, and sometimes they run an acute course.

The *diagnosis, prognosis,* and *treatment* will be considered under individual diseases.

II. LOCAL DISEASES.

IN treating of local diseases, it is proposed to indicate the general clinical characters which belong to each organ or part, and the methods to be employed in their investigation, before entering upon the consideration of the individual disorders to which they are liable. It may be stated once for all, however, that it is always of essential importance to study the constitutional condition of the patient, as this often has a material influence on the diagnosis, prognosis, and treatment of local affections. Some of the more important symptoms will be considered as fully as space will permit.

CHAPTER I.

AFFECTIONS OF THE MOUTH AND TONGUE.

Clinical Characters.—Important indications are often afforded by the mouth and tongue, as to the state of the system generally and of the alimentary canal, but these parts may also be the seat of local affections, which require special treatment, and it is to these that attention will now be directed. Their presence may be revealed by some or all of the following symptoms and signs:

1. Altered sensations, such as pain, soreness, a feeling of heat, dryness, and various disturbances of the sense of taste. 2. More or less interference with the actions carried on in the mouth, viz., mastication, sucking, deglutition, and articulation. These acts are also often attended with pain. 3. Changes in the quantity or quality of the saliva, and the escape of unusual discharges, such as pus, blood, &c. 4. A disagreeable odor of the breath, which may amount to extreme fetor. 5. Occasionally the act of breathing is interfered with, from mechanical obstruction to the passage of air. 6. A careful examination of the mouth, with the aid of a good light, will reveal the condition of the parts as to color, the presence of any swelling, deposit, ulceration, &c. It is also necessary to look to the state of the glands in the neighborhood.

I. Inflammations of the Mouth.—Stomatitis.

Stomatitis is a very common affection, and occurs under several forms. It will be most convenient first to describe the symptoms and characters of each, and then to consider their causes, treatment, &c., as a whole.

1. Simple, Catarrhal, Erythematous, or Diffuse.—When acute, it begins as small, bright-red patches on the inside of the cheeks, or at the angles of the mouth. Ultimately, by extension and coalescence of the patches, the whole surface may be covered. There is more or less swelling of the affected parts. At first the surface is dry, but soon excessive secretion forms, containing many imperfect cells. Superficial erosions or ulcerations are often produced. Pain or soreness is felt, with heat, as well as a slimy sensation in the mouth, and impaired or unpleasant taste. The breath is often disagreeable. There are generally indications that

the alimentary canal is out of order, in a furred tongue, loss of appetite, and, in children, disturbed bowels and flatulence; children are also irritable and sleepless.

Catarrh of the mouth often occurs as a chronic affection.

2. FOLLICULAR OR PAPILLARY.—Small ulcers often form in the mouth, which are the result of localized inflammation in the mucous follicles. At first little red raised spots are seen, which feel hard; these are the enlarged and obstructed follicles. As a rule they soften and burst, discharging their contents, and leaving small, circular, well-defined ulcers, with some surrounding redness. A good deal of soreness is complained of.

3. APHTHOUS OR CROUPOUS.—Much confusion has existed with regard to the use of the term "aphthæ," but it seems best to restrict it to certain small ulcerations, which have a special mode of origin. They commence as small, whitish, or whitish-yellow spots on the lips, cheeks, palate, or tongue, which are often in considerable number, and may become confluent. More or less redness surrounds them. These are generally considered to be *vesicular*, and to contain a fluid, which gradually becomes opaque, while the vesicles ultimately rupture. Some, however, regard them as solid exudations under the epithelium, of a "croupous" nature, which separate from the circumference towards the centre, leaving superficial ulcerations.

A considerable amount of pain usually exists, rendering sucking, mastication, deglutition, or speaking, very difficult to perform. The buccal secretion is increased, and there may be much salivation. The breath has often a very disagreeable smell. Infants are usually feverish and restless, even for some days before the aphthæ appear. They refuse nourishment, but are thirsty. The tongue is furred, and diarrhœa or vomiting may be present.

4. ULCERATIVE—DIPHTHERITIC—GYNGIVITIS ULCEROSA.—This is a form of inflammation which usually ends in extensive and unhealthy ulceration, and may occur as an epidemic. It is regarded by some as of a diphtheritic nature. As a rule it begins on the margin of the lower gums in front, but may extend backwards, or to the lips, cheeks, or tongue. The gums appear much congested, swollen, and spongy; bleed very readily, and seem separated from the teeth. Soon a deposit is observed, in the

form of membranous-looking patches, at first whitish, but soon becoming gray, or even black. Tolerably firm and adherent at the outset, and leaving a bleeding surface when detached, the substance soon becomes soft and pulpy. Some consider that the mucous membrane itself is involved, a "diphtheritic slough" being formed. The patches usually separate, leaving irregular ulcers, which may spread and run together so as to produce an extensive ulcerated line or surface. Their margins are raised, the membrane around being congested, swollen, and œdematous. They are usually not deep, and their surface is covered with a pulpy, yellowish substance. If properly treated, they generally heal quickly, but in some cases serious results follow, the teeth dropping out, and the jaws becoming carious or necrosed.

The subjective symptoms are generally severe. There is a great deal of pain, increased by any movement of the jaws or irritation; hence there is much difficulty in chewing or swallowing. The saliva is very abundant, and frequently mixed with blood and other matters. The breath is very fetid. Often the glands in the neighborhood are enlarged and tender. As a rule the constitutional symptoms are but slight.

5. PARASITIC—FUNGOUS—THRUSH—"WHITE MOUTH," &c.—By these and other names an affection of the mouth is described, which is due to the presence of a parasitic fungus, the *oidium albicans*. At first red patches appear, on which whitish points show themselves, and these by extension and coalescence may form considerable patches of variable thickness. They look like curdled milk, being of a soft consistence, and soon being easily detached. They consist of epithelium and fat, in which are imbedded the sporules and filaments of the fungus. The deposit first appears generally about the angles of the mouth, but may be found on any part of it, and even extends occasionally to the pharynx, larynx, œsophagus, or, very rarely, to the stomach. There is necessarily a good deal of pain and soreness about the mouth, which is hot and dry, the saliva being diminished in quantity at first.

In very young infants thrush comes on as a distinct affection, being preceded by some slight fever, and attended with digestive disturbances, as shown by vomiting, diarrhœa, abdominal pain, tenderness, and swelling, and irritation about the anus. In most cases, however, it is associated with some pre-existing disease, especially certain acute specific fevers and chronic exhausting diseases, such as phthisis. Under these circumstances there may be no symptoms. In connection with the acute specifics, it does not increase the danger, but in the chronic affections it is commonly a sign of approaching death.

It is not known whence the spores of the fungus come, or how they reach the mouth. The decomposing food and epithelium seem to afford a proper nidus for their growth, which is favored by the parts being kept at rest, and also by want of cleanliness.

6. Gangrenous—Cancrum Oris—Noma—Water Canker.—This is a very rare, but exceedingly dangerous form of stomatitis. It begins insidiously, and almost invariably first affects one of the cheeks, attacking its inner surface. When the case comes under observation, there is usually a circumscribed, hard swelling in the cheek, with surrounding œdema. The skin is tense, shining, and hot, generally red, the color shading off from the centre, which is bright; sometimes the surface is pale or mottled. The mucous membrane is said to be merely reddened at the outset, but soon becomes discolored and gangrenous, and a vesicle often rises upon it. When examined, a small, irregular ulcer is usually seen, with jagged, red, or livid edges, and a sloughy surface. After a time the central spot of bright redness becomes livid, and finally black, being converted into a dry slough, which extends rapidly. At the same time the gangrene is spreading internally, so that finally the entire cheek may be affected, or even one-half of the face or more, while the gums, lips, and tongue are also involved more or less. When the sloughs separate, the mouth is opened, the teeth often drop out, and the bones may be exposed and necrosed. A hideous excavation is left, with ragged, gangrenous edges, which may still go on spreading. If the destructive process is checked, the surface may clean, and healthy granulation take place, leading to ultimate cicatrization, but great deformity often results, with adhesion of parts.

The gangrene does not necessarily spread to the extent described above. It may be limited, so as only to produce a hole in the cheek, which ultimately closes up, or remains as a fistulous opening. The glands and tissues around are always infiltrated, swollen, and hard.

One of the most striking features of this disease is the *very slight degree of pain and tenderness* which accompany it, which indeed may be altogether absent. A large quantity of saliva flows from the mouth, extremely disagreeable, and mixed with blood and grangrenous discharges. Serious hemorrhage does not occur, because the vessels are filled with firm coagula. The breath is necessarily excessively foul, and there is a gangrenous odor constantly present.

The *general symptoms* vary considerably, but it is often observed, even when the disease is extensive, that they are by no means severe. Much will depend upon the previous condition of the patient. There is not much fever, as a rule, the skin being cool, and the strength may be fairly maintained for a while, at the same time food being taken eagerly. The *pulse* at first is rather frequent. If the case advances, there is a tendency to prostration, the patient ultimately becoming extremely low and asthenic, with a very feeble and small pulse. Food may be taken to the last, and there is much thirst. Diarrhœa often sets in. Delirium or drowsiness is frequently present. Death occurs from blood-poisoning by absorption (septicæmia) or from *asthenia.*

7. MERCURIAL.—The first effect of mercury is to produce redness and tumefaction of the gums, which feel tender and bleed readily, while the patient experiences a peculiar metallic taste, and saliva is increased, and the breath has a characteristic unpleasant odor. Afterwards, superficial grayish sloughs and ulcerations form along the margins of the teeth, matter escapes, and the gums become detached, the teeth loosening, or even falling out. There may be extensive inflammation of the mouth and tongue, proceeding to ulceration, suppuration, or even gangrene. Salivation becomes very profuse, various discharges being mixed with the saliva. The salivary and lymphatic glands, and other structures, swell and are painful, while there is much pain in the mouth and face, difficulty in moving the jaws in swallowing or speaking. Only slight constitutional symptoms are usually present.

ETIOLOGY.—*Predisposing Causes.* 1. *Age.*—The different forms of stomatitis are far most common in infants and young children. "Catarrhal" occurs chiefly from two months to one year; "ulcerative," but from five to ten years; "thrush" in the first few weeks of life; "gangrenous" from two to thirteen years.

2. *Improper hygienic conditions* act as powerful predisposing causes, including want of cleanliness, impure air, unhealthy residence, insufficient food, &c. Hence these affections are exceedingly rife among the children of the poor, especially those living in large towns. This applies particularly to the more severe varieties of stomatitis, the gangrenous form being rarely met with except among this class of patients. As regards diet, it is to be noted that infants are very commonly affected who are brought up by hand, fed on artificial food, who have suckled too long, or been nursed by an unhealthy mother.

3. *State of Health.*—Children who are debilitated from any cause, and those prematurely born, are very prone to this class of diseases. Congenital syphilis, or the presence or recent occurrence of one of the exanthemata, often gives rise to stomatitis. Thrush is commonly associated with typhoid fever. Chronic wasting diseases, especially phthisis, are the usual predisposing causes of thrush in adults. *Gangrenous* stomatitis rarely occurs except after some acute illness, especially severe measles.

Exciting Causes.—1. *Local irritation* is one of the most frequent causes of stomatitis. This includes neglect of cleansing the mouth, irritation of dentition, decayed teeth, suckling imperfectly-formed or inflamed nipples, or for too long a time; as well as all forms of mechanical or chemical irritation, heat and cold, and excessive smoking. Under the same category must be included the inflammation accompanying wounds, ulcers, &c. 2. The milder varieties may be dependent upon disorder of the alimentary canal. Repeated "follicular stomatitis" in adults generally indicates something wrong in connection with the stomach. 3. The *presence of some poison in the blood* frequently excites inflammation in the mouth. This is partly the reason of its occurrence in the acute specific fevers. Metallic poisons, however, are those which ordinarily act in this way, especially mercury. 4. *Catarrh of the mouth* may be due to extension of inflammation from neighboring parts. Thus it may be associated with erysipelas of the face, or throat affections. 5. *Contagion* produces some forms of stomatitis. "Thrush" can be propagated by direct transplantation of the fungus, though it does not usually spread in this way, but probably is due to the presence of the spores in the air, which, in the mouth, find favorable conditions for their development. Some believe that the ulcerative variety is contagious.

TREATMENT.—This is to a great extent indicated by the *causes* of these affections, and may be summed up thus:

1. *Hygienic conditions* must be properly observed and regulated in every respect. 2. Particular attention is required with regard to *diet*, especially in the case of infants. If they are suckling, care must be taken that they are not fed too frequently or excessively, and that the nipple is properly cleansed, and in other respects satisfactory. At the same time the mother's health must be looked to, and she must be prevented from using irritating articles of food. If brought up "by hand," the milk used should be examined, the bottle kept scrupulously clean, and used only at regular intervals. Inquiry should also be made as to artificial diet employed, as this is often of a very irritating nature. 3. The *state of the alimentary canal* often needs correction. Aperients are frequently called for, such as castor oil, a dose of jalap with calomel, or rhubarb with magnesia. Antacids are also valuable, especially lime-water with milk, carbonate of soda, magnesia, or chalk. Excessive diarrhœa, if present, must be checked by appropriate remedies, provided all irritating materials have been discharged. 4. A most important indication is to inquire into and remove all sources of *local irritation*, such as dentition, bad teeth, &c. Under this head must be noticed the necessity of cleansing the mouth properly in infants, which is most useful both for prevention and cure. In the case of mercurial stomatitis, it is of course essential to prevent any more of the poison from entering the system. 5. *Local applications.*—In simple stomatitis nothing is required, unless there is much mucus on the surface, when it is desirable to wash the mouth out with a weak solution of carbonate of soda or chlorate of potash. In the "aphthous," "follicular," and "ulcerative" forms, a solution of chlorate of potash is very valuable, either employed as a mouth

wash, or directly applied with a camel's-hair brush. If there is much irritation, demulcent washes afford relief, such as thin mucilage. Subsequently astringent applications are often called for, especially alum, in solution or powder. The direct application of nitrate of silver to ulcers may be requisite, either in the solid form, or as a solution, if they do not heal. In thrush various local remedies are recommended, viz., a solution of sulphite of soda (ʒi ad ℥i), borax and honey, vinegar and water, creasote, bromide of sodium with glycerin and water, or solution of chlorate of potash. Cancrum oris calls for energetic local treatment. The gangrenous surface must be at once freely and effectually destroyed by strong nitric or hydrochloric acid, the former being preferable, and it may be necessary to repeat the application. Antiseptic solutions should be abundantly used as washes, such as those containing Condy's fluid, chlorine, or carbolic acid, and these may be also employed as dressings. Chlorate of potash solution is very valuable in these cases. Poultices externally are also necessary, these being changed frequently, and covered with some antiseptic. 6. *General Treatment.*—In the majority of cases no *general treatment* is required, but if the health is lowered from any cause, it is important to use means for its improvement. When there is extensive ulceration, *tonics* and nutritious diet are often of essential service, and the internal administration of chlorate of potash leads to most satisfactory results. In gangrenous stomatitis, one of the most necessary parts of the treatment is, to keep up the patient's strength in every possible way, by means of nourishing soups, wine or brandy, ammonia and decoction of bark, mineral acids, or quinine with iron. Chlorate of potash solution should also be employed as a drink.

GLOSSITIS.—INFLAMMATION OF THE SUBSTANCE OF THE TONGUE.—PARENCHYMATOUS INFLAMMATION.

This is an inflammation of the actual tissues of the tongue, leading to an exudation among its muscular fibres, and rarely involving the latter also. It is a very acute and dangerous affection, though, fortunately, but seldom seen.

SYMPTOMS.—The entire tongue is usually implicated, and presents the following characters. It is enlarged, so that the mouth cannot contain it, and may project some distance beyond the teeth, being marked by them at the sides, and the pressure may lead to ulceration. The surface is dark-red, generally smooth, shining, and tense, but may be fissured. The dorsum is covered with fur, which tends to be brownish. Owing to its protrusion and exposure, the tongue soon becomes dry. If resolution does not rapidly take place, small abscesses may form, which unite together, and then burst or are opened. Rarely gangrene occurs. The tongue may remain large for a long time. The local symptoms due to this condition are obvious. There is considerable pain and tenderness, and a feeling of heat, with other uncomfortable sensations. All the functions of the tongue are necessarily greatly interfered with. Occasionally by its mechanical obstruction, or by pressing upon, or causing œdema of the larynx, it seriously impedes respiration, and may even threaten asphyxia. Much salivation exists, and the breath is very disagreeable. The glands and tissues around are usually inflamed, and the face may appear tumid and congested, from pressure on the jugular veins.

General Symptoms.—These are usually severe, there being much inflammatory fever, with marked restlessness. Nutrition becomes greatly impaired, and there may be signs of imperfect aeration of blood.

ETIOLOGY.—1. Some *direct irritation* is almost always the cause of glossitis, which may result from mechanical injury, swallowing boiling liquids, acrid or corrosive substances, the stings of insects, especially the bee and wasp. 2. It is very rarely associated with the presence of some poison in the blood, either mineral (*mercury*), *animal*, or vegetable. 3. Occasionally it occurs in the course of, or during convalescence from, one of the exanthemata. 4. It may originate in extension of inflammation from neighboring parts, such as the tonsil.

PROGNOSIS.—This is at all times a serious affection, but especially if it results from severe local irritation. It may lead to rapid suffocation. The existence of abscesses makes the prognosis worse.

TREATMENT.—The first thing to be done is to neutralize any irritating cause, if possible, as, for instance, in the case of the sting of a wasp, which should be immediately touched by solution of ammonia. If the glossitis is severe, the best treatment seems to be, to make free and deep incisions along its upper surface. In milder cases, leeches about the angle of the jaw are recommended. Ice should be constantly given to suck, and the parts kept moist. Saline aperients may be given, if required. Ammonia and stimulants are often called for internally. As food cannot be taken in many cases, it may be necessary to administer nutrient enemata regularly. If there is danger of asphyxia, it is sometimes requisite to perform laryngotomy or tracheotomy. Incisions must be made when there are signs of abscesses having formed.

CHRONIC GLOSSITIS is occasionally met with, either as the result of acute, or from some chronic irritation. It may affect the entire tongue, but is usually partial, the tongue presenting indurated fibrous patches, especially on the margins. A form is described, named *glossitis dissecans*, in which the tongue has deep furrows upon its surface, which tend to ulcerate.

As regards *treatment*, pressure, ligature of the lingual arteries, or excision, may be necessary.

ULCERS OF THE MOUTH AND TONGUE.

In addition to the forms of ulceration already considered, the following may occur: 1. *Herpetic ulcers*, due to an eruption of herpes in the mouth. 2. *Variolous ulcers*, resulting from small-pox pustules. 3. *Syphilitic*. These are very frequent on the tongue. 4. *Scorbutic*, chiefly seen about the gums. 5. *Cancerous*. 6. *Ulcers due to local irritation*. These are also common on the tongue, beginning often as small vesicles about the tip and sides. They are generally due to irritation of the teeth, and may become very hard, so as to simulate syphilitic ulcers.

TREATMENT.—This consists: 1. In the removal of all sources of local irritation. 2. In attending to the constitutional condition. 3. In the use of local washes, and direct applications, disinfectant, astringent, or demulcent, according to circumstances. Nitrate of silver, immediately applied, is often most useful. Chlorate of potash is also very valuable.

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CHAPTER II.

AFFECTIONS OF THE SALIVARY GLANDS.

PAROTITIS.—INFLAMMATION OF THE PAROTID GLAND.

Two forms of this disease must be noticed, which have essential differences from one another.

I. IDIOPATHIC PAROTITIS, or "MUMPS."—This is a form of inflammation which comes on as an independent disease, and is considered by many to be merely a local expression of a general condition, being, in fact, an *acute specific disease*, and belonging to the same group as the exanthemata. Others, however, do not look upon it in this light.

ETIOLOGY.—1. *Age.* Mumps rarely occurs except in young persons. About puberty it is very common, and also from five to seven years of age. 2. *Sex.* Males are much more frequently attacked than females. 3. It chiefly occurs in spring and autumn. 4. Almost always the affection assumes *an epidemic* form, but may be localized in houses, or institutions, where a number of young persons are aggregated together. It is generally believed to be *infectious.*

ANATOMICAL CHARACTERS.—As death rarely occurs, the conditions of the gland are not positively known. Some pathologists are of opinion that the inflammation begins in the cellular tissue which pervades it; others that a catarrh of the gland-ducts first occurs. Hyperæmia and enlargement are observed, the latter being due chiefly to infiltration of a serous fluid. Fibrinous exudation is not often observed, and a most important point to notice is, that there is no tendency to the formation of pus, which is an extremely rare event. The tissues around are more or less infiltrated. As a rule the swelling rapidly subsides, and the gland returns to its normal condition.

SYMPTOMS AND COURSE.—In most cases there is some premonitory fever, which lasts from one to three days, before local symptoms are manifested, though occasionally they come on simultaneously. As a rule, the pyrexia continues throughout the attack, but may subside on the appearance of the local signs, and it i seldom severe, nor does the patient feel particularly ill. A swelling or fulness appears in the region of either parotid gland, commencing just below the external ear, and then extending up t the zygoma, as well as to a variable extent over the face, an down the neck, producing much disfigurement. It has an elast feel, being firmer over the centre than at the circumference. The skin may be reddened over it, but is frequently unaltered. More or less pain or uneasiness is felt, with a sense of tension, increased by opening the mouth, masticating or swallowing; there is also tenderness on pressure. Salivation occurs now and then. Occasionally deafness is complained of. In the great majority of cases the swelling subsides about the fifth or sixth day, and has quite disappeared in two or three days more; but in the meantime the gland on the opposite side frequently becomes affected, and goes through a similar course, or both may be involved at the same time. A hardness occasionally remains for some time, and, in very exceptional instances, abscesses form in the gland, which open externally, or into the external meatus. The submaxillary gland is sometimes attacked, and the surrounding lymphatic glands, as well as the tonsils, are often enlarged.

An important character of this disease is its liability to *metastasis*, especially in adults. This may be preceded by some dangerous symptoms. The *testicle* is the organ most frequently attacked when the inflammation leaves the parotid, orchitis being produced, with effusion into the tunica vaginalis and œdema of the scrotum. Occasionally both glands are affected at the same time, or alternately for several times. The orchitis generally runs a favorable course, but it may end in wasting of the testicle. In females the labia, mammary gland, or ovary may be attacked in the same way. Meningitis has been stated to have occurred in very rare instances.

TREATMENT.—In most cases but little treatment is required. It is necessary to keep the patient indoors in a comfortable room, or even in bed if the case is at all severe. An aperient is useful at the outset, and the bowels should be kept regularly open.

Saline medicines may be given, so as to promote the action of the skin and kidneys, and during convalescence quinine is advisable. The diet should consist of liquids, especially milk and beef tea. Hot fomentations, and covering the part with cotton-wool, constitute the only local treatment generally needed. The application of a leech or two may possibly be required. If an abscess forms it must be opened, and any hardness that is left removed by friction with oil or by painting with tincture of iodine. When metastasis occurs it is recommended to excite the return of inflammation in the parotid by mustard poultices or blisters.

II. SYMPTOMATIC PAROTITIS—PAROTID BUBO.—In many acute diseases parotitis comes on as a complication or sequela, and this differs from the idiopathic form in its great proneness to end in suppuration. It is frequent in bad epidemics of typhus fever, but may be met with also in connection with small-pox, measles, scarlatina, cholera, pneumonia, &c. Sometimes it is the result of direct extension, as when it follows erysipelas of the face.

ANATOMICAL CHARACTERS.—After a period of congestion and tumefaction a substance collects in the ducts, which soon changes into pus. The lobules break down in the centre, and either form a number of distinct abscesses or run into one large one, the cellular tissue that separates them being destroyed. The parts around may be extensively involved, cellular tissue, muscles, periosteum, and bones, and the inflammation may even extend to the meninges of the brain or to this organ itself, as well as to the ear. Thrombi may form in neighboring veins, leading to embolism and septicæmia. Gangrene sometimes sets in. This form of parotitis does not, however, always follow this course, for resolution may take place.

SYMPTOMS.—These are usually by no means marked at the commencement, and the inflammation often comes on very insidiously. When it has advanced to suppuration the skin becomes red, and prominent fluctuating points appear. If the pus is not evacuated externally it may be discharged into the external meatus, pharynx, or mouth, or may find its way to the lower part of the neck or even into the thorax. The *general symptoms* are, as a rule, of a low, adynamic type. The untoward events mentioned above as sometimes occurring will be indicated by their respective symptoms.

TREATMENT.—Frequent poulticing and fomentations are necessary, and as soon as there are signs of suppuration proper incisions should be at once made. Internally stimulants and tonics are generally required.

CHRONIC ENLARGEMENT OF THE PAROTID is occasionally observed. It may be the result of previous inflammation, or be due to cancerous or other forms of tumor.

SALIVATION, OR PTYALISM.

Increased flow of saliva is a frequent and troublesome symptom, brought on by a variety of causes. In some cases it is not actually formed in excess, but is allowed to flow from the mouth instead of being swallowed, so that it appears to be abnormal in quantity. The amount varies greatly, and it may be exceedingly large, either continually running from the mouth, or causing a person to be perpetually spitting or swallowing. Many individuals saturate several handkerchiefs daily, as well as the pillow at night. The fluid is not quite identical with healthy saliva, and it may be mixed with various materials. It contains some mucus, with numerous epithelium-cells. Its reaction is alkaline, and it yields a good proportion of fat, but little or no ptyalin or sulphocyanide of potassium after a time. Albumen is sometimes present. Digestion is generally impaired, and considerable emaciation may be produced. Sometimes it is ejected from the stomach in considerable quantity.

ETIOLOGY.—1. Salivation accompanies, to a greater or less degree, the various sources of irritation about the mouth, already considered, such as stomatitis, ulcers, &c., and is produced by irritating substances taken into the mouth. This does not result from a direct excitement of the nerves influencing the salivary glands, but from reflex excitation. 2. Reflex irritation through other nerves often causes ptyalism. Thus it is associated with throat inflammations, many diseases of the stomach and pancreas, worms in the intestines, &c.; in pregnancy it is a very common symptom. 3. In some nervous diseases salivation is often met with. Thus it occurs among the inmates of lunatic asylums to a considerable extent, and is also observed in hydrophobia, hysteria, paralysis, and neuralgia of the face. In the affection last mentioned, it is sometimes a most distressing symptom, of which some marked instances have come under my notice. In some of these cases it is produced in a reflex manner, in others by some direct influence from the brain. 4. Certain metallic and vegetable substances, when taken for some time, induce ptyalism. Of these the most important is mercury, but iodine and other substances sometimes act in this way. They produce this effect partly by causing local irritation in the mouth, but probably also they influence the secretion directly. 5. *Critical salivation* is that which attends some cases of fever, but it is not always associated with a crisis. 6. Infants and old people are liable to have a flow of saliva from the mouth. In the former it is often due to dentition. In both there is frequently no excess produced, but it is allowed to escape from the mouth, instead of being swallowed. 7. *Idiopathic salivation* is that form which occurs without any obvious cause.

Treatment.—1. The *cause* must be sought out, and, if possible, removed. In many cases treatment directed to this end is all that is required. 2. *Local* astringent mouth-washes are useful, such as solutions of alum, tannic acid, oak-bark, and weak mineral acids; or alum may be sucked. 3. *Opium* is recommended as a valuable internal remedy in obstinate cases.

CHAPTER III.

AFFECTIONS OF THE THROAT.

Clinical Characters.—Throat complaints are of very common occurrence, and give rise to much discomfort, and to some very troublesome symptoms. They are indicated by the following clinical phenomena:

1. The presence of soreness, pain, or other abnormal sensations. These vary greatly, both in degree and kind; but among the most common are a sense of dryness, burning, tightness, or as if a foreign body were present, which induces a constant desire to hawk or swallow. There may also be external tenderness. 2. *Deglutition* is interfered with in different ways. It may be painful or difficult, or even quite impossible, and sometimes substances tend to pass in wrong directions, such as into the larynx or posterior nares. The physical conditions of the materials which are being swallowed—whether solid or liquid, hot or cold, &c.—often influence the degree of dysphagia. 3. The *voice* is frequently altered, being somewhat hoarse or husky, or even completely altered in its quality, becoming thick and nasal. The act of speaking may cause pain. 4. *Cough* is a very common and unpleasant symptom attending throat affections, especially those of a chronic nature, and these by no means receive the amount of attention they deserve, as a cause of cough. Even in lung affections, especially phthisis, the state of the throat often increases this symptom considerably, and this is true also of the so-called "stomach cough," ac-

companying dyspepsia. Frequently it is attended with the discharge of much mucus. 5. There is not, as a rule, any difficulty of breathing, but considerable dyspnœa may be present, especially on lying down, and patients often breathe with the mouth wide open, and snore loudly. 6. The *breath* has commonly a peculiar and disagreeable smell. 7. *Deafness* may be present, in consequence of obstruction about the opening of the Eustachian tube. 8. A *careful examination* of the whole of the fauces is of course requisite, whenever there are signs that this part is in an abnormal state. A good light is needed, and it is sometimes useful to employ artificial light by means of the reflector of the laryngoscope. The tongue must be kept down by a depressor or by the finger, so as to get a full view. In some cases it is also desirable to use the finger for the purpose of feeling. By this examination we gain a knowledge, *a*, of the appearance of the general surface as regards color, degree of moisture, &c.; *b*, of the presence of any deposit or accumulation of secretion; *c*, of the general form and dimensions of the pharynx and its openings, as well as of the size, shape and other characters of the soft palate and its arches, the uvula, and tonsils; *d*, of the existence of any enlarged follicles, abscesses, ulcers, vesicular or other eruptions, gangrene, old cicatrizations, polypi, cancerous or other tumors. At the same time, the external structures of the neck must be observed, particularly those about the angles of the jaw. It will also be well to notice the state of the mouth and lips.

Before proceeding to consider throat diseases individually, it may be useful to enumerate them under the two groups—*acute* and *chronic*, so as to give a connected idea with regard to the conditions which have to be borne in mind, when symptoms point to the throat as being the seat of mischief.

1. *Acute.* *a. Diphtheritic inflammation or diphtheria.* *b. Scarlatinal sore throat.* *c.* Croupous inflammation, accompanying *croup*. *d. Thrush*, extending from the mouth. *e. Various degrees of more or less acute catarrh of the pharynx, from a mere relaxed sore throat to an extensive catarrhal inflammation.* *f. Acute follicular pharyngitis.* *g.* Eruptions on the mucous membrane, especially *herpetic* and *variolous*. *h.* Ulcerative, malignant, or gangrenous sore throat. *i. Acute tonsillitis.* *j. Acute ulceration of the tonsils.* *k.* Acute pharyngeal abscess.

2. *Chronic.* *a. Chronic pharyngitis of different kinds.* *b. Chronic relaxation and congestion of the mucous membrane.* *c. Enlarged and elongated uvula.* *d. Chronic enlargement of the tonsils.* *e. Chronic ulcerations and erosions*, and their results, in the form of cicatrizations, thickenings, or destruction of parts. *f.* Chronic pharyngeal abscess. *g.* Polypi, tumors, and cancerous growths. *h.* Dilatation of the pharynx.

Some of these have already been noticed, and others will call for consideration under the respective diseases to which they belong. Only those of a local nature will now be entered upon, but very rare affections will not be further alluded to.

ACUTE CATARRH OF THE PHARYNX—CATARRHAL PHARYNGITIS. RELAXED SORE THROAT—CYNANCHE PHARYNGEA—ANGINA SIMPLEX.

A great number of sore throats occur, which may be included in this general group, as they are all of the nature of catarrh of the pharyngeal mucous membrane, which differs much in its extent and severity.

ETIOLOGY.—*Predisposing Causes.*—1. This affection may occur at any age, but is most common in adults, probably because they are more exposed to the exciting causes. 2. Former attacks seem to increase the liability to sore throats, and some individuals are continually subject to them. 3. Anything that lowers the health is stated to be a predisposing cause. Certainly this is true with regard to living in a hospital for some time. Persons who are constitutionally weak appear to suffer with unusual frequency, and syphilitic persons are decidedly more liable. Intemperance and other forms of irregularity are said to be predisposing causes. 4. Most cases occur during spring and autumn.

Exciting Causes.—1. Exposure to cold and wet, but especially to sudden change of temperature is the most frequent cause of sore throat. It is one of the forms in which "taking cold" manifests itself. Indeed in many cases it seems to be but part of a general catarrh from this cause. 2. Occasionally, in its milder forms, it appears to be due to some derangement of the alimentary canal. 3. Local irritants produce more or less inflammation, and it may then be very serious, as from swallowing hot water, chemical irritants, &c. 4. The "hospital sore throat" may be due to some poison in the atmosphere acting on the system, though it frequently occurs without there being any cases in the hospital likely to give rise to such a poison. 5. Pharyngeal catarrh often accompanies the exanthemata.

SYMPTOMS.—Uneasiness, soreness, or pain is experienced in the throat, according to the degree of inflammation, and this is often accompanied with a sense of heat and dryness. Swallowing is always unpleasant, and often painful, though the patient may be constantly performing the act, owing to a feeling of something in the throat, especially if the uvula is involved. There is also frequent coughing and hawking, in order to remove the secretion formed. The voice is often thick and husky, especially as the laryngeal mucous membrane is affected in many cases, and then there may be dyspnœa. All the symptoms are generally worse during the night and after sleep. Occasionally there is deafness.

Examination reveals either slight or considerable general redness, which is usually bright, but may tend to lividity. The surface appears dry and glistening. There is frequently much submucous œdema where the tissue is loose, giving rise to swelling, and a watery, translucent appearance, which is particularly seen in connection with the uvula. As the case advances a deposit of secretion often can be observed in patches and points over the back of the fauces and on the tonsils; these sometimes look remarkably like diphtheritic patches, but they are easily detached, without causing bleeding or excoriation. Not uncommonly superficial erosion, ulceration, or suppuration occurs. There may be swelling and tenderness about the angles of the jaw.

General Symptoms.—In slight cases, the system is not at all affected. The more severe forms may be ushered in with chilliness, headache, and pains in the limbs, and attended with the usual symptoms of fever, varying in degree. The pulse may rise to 100 or 120, and the temperature to 102°, or even higher. A bright blush occasionally suffuses the face and upper part of the body, without there being any reason to suspect that scarlatina is present. In two cases I have met with albuminuria, which entirely disappeared after a time.

Sore throat may come on very rapidly, and attain considerable severity in a few hours, which is particularly the case with a form of sore throat which is not uncommonly met with among the residents of some hospitals. This generally sets in during the night, and by the morning the symptoms are very prominent. There is much œdema and swelling, without any particular redness, deglutition being very uncomfortable and difficult. Under appropriate treatment the inflammation will subside equally rapidly. It seems to be of an erysipelatous nature.

The *duration* of pharyngeal catarrh varies, but it has generally disappeared within a week.

TREATMENT.—In slight cases of sore throat the application of a wet rag round the throat at night, covered with some flannel, is all that is necessary, but when the affection is severe, more definite treatment is required.

General.—It is well to keep the patient quiet, in a comfortably warm room. A saline aperient may be given, followed by saline medicines for two or three days. Afterwards quinine is useful, with or without tincture of iron, or, in many cases, these may be administered from the first. Many recommend a mixture containing dilute hydrochloric acid and chlorate of potash. Dr. Ringer advocates giving tincture of aconite in small and repeated doses, in this, as well as in other inflammations about the throat. It is not necessary to keep the patient low, therefore, a good quantity of beef tea, milk, or other liquid, nutritious food may be permitted. Mucilaginous drinks give relief, and so does the sucking of ice. Port wine is often very useful, especially during convalescence.

Local.—At first, steam-inhalations, tepid milk and water gargles, and poultices, or fomentations over the front of the neck give most relief. Afterwards, astringent gargles are useful, such as those containing alum, tannin, or dilute acids. A gargle containing port wine acts very well. It may be desirable to apply nitrate of silver or its solution. If there is dangerous œdema, it is necessary to scarify the surface, and if suppuration should occur, the pus must be let out by incision.

In the "hospital sore throat," the treatment which I have found always rapidly effective is to persevere in steam-inhalation, in frequent gargling, and in the external application of heat and moisture; and to take large quantities of beef tea, a glass of port wine every two or three hours, and quinine in three or four grain doses every three hours. Usually, under this treatment, all symptoms disappear before evening.

As *prophylactic measures* in those who are subject to sore throat, frequent cold douching of the throat externally, and gargling with cold water, or even mild astringents, are advisable. The general health must be improved, all injurious habits put a stop to, and a change of air is often attended with much benefit. A course of tonic medicines frequently leads to good results.

ACUTE FOLLICULAR PHARYNGITIS.—This form is characterized by the follicles of the throat becoming chiefly attacked, these being enlarged, hard, and red. It is attended with a good deal of soreness or pain, and much secretion forms, which causes continuous hawking. Sometimes the follicles suppurate and ulcerate.

ETIOLOGY.—The special causes which are said to give rise to follicular pharyngitis are: excessive use of the voice, it being a part of "clergyman's sore throat;" stomach derangements, and the use of hot condiments and hot drinks. It generally occurs in persons whose health is impaired.

TREATMENT.—The alimentary canal must be looked to, and improved if required, the bowels being kept open. Tonic medicines are indicated, such as iron and quinine, or acids with decoction of bark. Chlorate of potash internally is also recommended. Nutritious diet is requisite, with some wine. The voice must be rested, and for local applications astringents are best, or they may be of a soothing mucilaginous nature at first, if there is much irritability. It may be requisite to touch ulcers with strong solution of nitrate of silver, or with the solid stick.

ACUTE TONSILLITIS—AMYGDALITIS—CYNANCHE TONSILLARIS—QUINSY—PARENCHYMATOUS INFLAMMATION OF THE TONSILS.

ETIOLOGY.—*Predisposing Causes.* 1. *Age.*—This affection is most frequent among young persons. 2. Previous attacks, or a permanently enlarged condition of the tonsils, render them more liable to be again inflamed, many individuals suffering periodically. 3. Sometimes the complaint seems to run in families. 4. It is most frequent during spring and autumn.

Exciting Causes.—Tonsillitis is almost always supposed to result from "taking cold," especially in consequence of damp, cold winds. In some instances it occurs almost in an epidemic form.

SYMPTOMS.—As a rule, there are some general febrile symptoms before any occur pointing to the throat as the seat of mischief. These are soon manifested, however, and they may appear simultaneously with the fever.

Local.—At first uneasiness is felt over one or both tonsils, which soon increases to considerable pain, of a dull, aching character. The throat feels dry, and there is a most uncomfortable sense of the presence of a foreign body. External tenderness is felt behind the angles of the jaw, which may be considerable. Anything that irritates the part increases the pain very much, and hence deglutition causes much distress, the pain then often shooting towards the ear; at the same time the act is difficult, on account of the obstruction. In bad cases, fluids return through the nose. After a time an increased secretion of sticky mucus occurs, which is very unpleasant, as it entails frequent efforts to swallow or hawk, and thus leads to much discomfort. The *voice* is characteristically altered, and by this alone a diagnosis may generally be made. It has a thick, muffled, guttural, or nasal character, which cannot be mistaken when once heard; occasionally it is altogether lost. *Breathing* is *not* interfered with as a rule, but if both tonsils are greatly enlarged dyspnœa may be present, especially on lying down. There is loud snoring during sleep, and on awaking the symptoms are always worse. The breath is very unpleasant. Salivation may be present. Deafness and noises in the ears are often complained of.

Examination is not always easy, but if it can be effected the appearances observed are,—general redness of the fauces, but more particularly of one or both tonsils; enlargement of these, sometimes so great that they meet in the middle line, and almost completely block up the passage, looking like balls of flesh, and they may actually ulcerate from mutual pressure; white or yellowish opaque spots or patches on the surface, being the products of secretion from the follicles. The palate and uvula are also swollen and œdematous, the latter being almost always seen to adhere to one of the tonsils.

When the parts cannot be inspected, the finger must be made use of in order to feel the tonsils, and this is especially required in children, or in the later stages of the complaint, to ascertain if suppuration is taking place. There is very often swelling of the salivary glands, and of the structures about the neck, especially the lymphatic glands, which are hard and tender, and a good deal of stiffness and uneasiness is experienced.

General.—Considerable fever is present as a rule, and the patient feels decidedly ill, being often much prostrated. The temperature frequently rises to 102° or more, and may reach 104°, the pulse ranging from 100 to 120.

Severe headache is frequently complained of, and the patient is very restless, occasionally there being slight delirium at night. The tongue is covered with a thick creamy fur, appetite is lost, but there is much thirst, and the bowels are constipated. Redness of the skin is now and then observed.

The *urine* is markedly febrile, and the chlorides are deficient, or may be almost entirely absent.

COURSE, DURATION, AND TERMINATIONS.—This affection varies greatly in its severity. It usually runs a course of five or six days before reaching its height. Frequently only one tonsil is involved, but in many cases both are attacked, generally in succession, but occasionally at the same time. The entire duration is usually within ten days. The *pathological terminations* are: *a. Resolution. b. Suppuration.* This is very common, and is indicated by the pain becoming more pulsating or throbbing, and shooting towards the ear; by rigors; and by the swollen tonsil feeling soft and fluctuating, or the color of the pus may actually be evident through the redness. The abscess often bursts suddenly, either spontaneously or from some mechanical irritation, or it is opened. Rapid improvement takes place afterwards. Only one tonsil suppurates, as a rule. *c. Gangrene.* This is a very rare occurrence, and only met with in those who are low and debilitated. *d.* After *suppuration,* the tonsil sometimes remains large and granular for a considerable time, especially after repeated attacks and in weak individuals. The *clinical termination* is almost invariably in recovery. Death is an exceedingly rare event, resulting from hemorrhage or extension of inflammation to the larynx. The affection may remain chronic, especially if a tonsil has been affected several times.

TREATMENT.—Many believe in the efficacy of an emetic of ipecacuanha and tartar emetic for the purpose of stopping the progress of tonsillitis, if given at the outset. Dr. Ringer advocates the use of tincture of aconite. Guaiacum has also been recommended as a specific. A blister applied over the front of the neck has been stated to prevent suppuration from occurring. Certainly, in many cases which present themselves, the time for these measures has gone by, and the following treatment seems to me the most rational, and is one which is always attended with very satisfactory results. The patient, being kept in a warm room, and not allowed to speak, should persist in the application of heat and moisture, both to the throat internally and outside. For this purpose, steam inhalations and gargles of lukewarm water, or milk and water, must be very frequently used, and a little Condy's fluid may be added to the water, which diminishes the unpleasant taste and odor of the breath. At the same time, very hot and well-made linseed-meal poultices should be applied round the front of the neck, and changed at frequent intervals; or *spongiopiline*, wrung out of hot water, answers very well. When these are changed, the part should be well fomented. Internally, it is always desirable to give a free saline aperient at the commencement, and, provided the patient is not prostrated, a saline mixture may be administered for two or three days. In many cases, however, there is much depression, and then it is best to administer quinine (gr. iij every four hours), at the same time, however, allowing some saline drink, such as one containing citrate of potash, added to some mucilaginous and soothing liquid, so as to keep the skin and kidneys acting freely. The bowels must also be kept open throughout. The dietetic part of the treatment is, in my opinion, of much importance. It is not advisable to reduce the patient, and a considerable quantity of liquid nutritious food should be taken, in moderate quantities, at regular and frequent intervals. With regard to stimulants, they are certainly often called for, and port wine is best, of which four, six, or eight ounces may be given in the twenty-four hours, in divided doses. The sucking of ice is very grateful, and probably has a direct effect on the inflamed tonsils. It is often necessary to administer something to procure rest at night, such as a dose of Dover's powder or hydrate of chloral, but it is not advisable that sleep should be too prolonged, and the patient must lie with the head high.

Under this treatment the inflammation will subside, if resolution is going to happen; or if it tends to suppuration this will be hastened. When there are indications of the formation of pus, it is desirable to let it out, and thus give immediate relief; or it may be requisite to puncture the tonsils even though there is no distinct evidence of pus, should breathing be greatly impeded. Some advocate the use of irritating applications to the neck externally, such as sinapisms, liniments, and blisters, but to me these appear decidedly objectionable. Possibly, if there are very severe local symptoms with great swelling, it may be advisable to apply two or three leeches behind the angle of the jaw, but this is very seldom required.

During convalescence tonics are needed for some time, with good nourishing food, and some wine. Locally astringent gargles or other applications are necessary, especially glycerin of tannin, tincture of steel with glycerin, or nitrate of silver solution. A change of air does much good. Prophylactically cold water and astringents may be employed, along with measures for maintaining the general health. If the tonsils are very large, it may be necessary to excise them.

ULCERATIONS OF THE THROAT.

Ulcers are very common in connection with the various structures of the throat, and they may conveniently be considered together. The principal forms met with are the following: 1. *Catarrhal*, which are slight and superficial, very frequently present, especially at the back of the pharynx, and often associated with chronic catarrh. 2. *Follicular*. These are generally small, circular, or oval, corresponding to the follicles, but may by their union become irregular and of some size. 3. *Syphilitic*, either secondary or tertiary. 4. *Scarlatinal*. 5. *Diphtheritic*. 6. *Ulcers* following eruptions, such as herpes. 7. *Gangrenous ulceration or sloughing sore throat, cynanche or angina maligna*. This condition is generally associated with syphilis or scarlatina, but it may be independent of these affections. Thus, it may follow severe catarrhal inflammation if the patient is in a very low state from any cause; occasionally it occurs as a complication of typhus, enteric fever, or other exanthemata. It spreads more or less extensively, but not as a rule deeply, and the mucous membrane is dusky, while there is much œdema around. 8. Ulcers sometimes occur on the *tonsils* of which the cause is obscure. I have observed them in several instances, and they might easily be mistaken for syphilitic ulcers, but there was every reason to believe that no taint of this nature existed in these cases. Probably they originate in blocking up and inflammation of the follicles of the tonsils. 9. Possibly *cancer* might give rise to an ulcerated surface in the throat.

SYMPTOMS.—There may be none, and much ulceration may exist, of which a patient is quite unaware. As a rule, however, local symptoms are present to a greater or less degree. There may be merely uneasiness or pain and difficulty of swallowing, but when parts are destroyed, most unpleasant and dangerous symptoms arise. Food, especially of a liquid kind, tends to pass into the posterior nares or down the larynx, instead of into the œsophagus. The voice is completely altered. Offensive matters are hawked up, and the breath is very foul. It is important to notice also that dyspnœa is often present, with very noisy breathing, and that *sudden death* may occur from suffocation, without there being any marked indication that this is going to happen, in consequence of the ulceration involving the upper part of the larynx. In making an examination for ulcers, it is necessary to raise the uvula in order to see the upper part of the back of the pharynx, where they often occur, and may otherwise be overlooked.

Patients are often in a low condition of health, and there may be much emaciation and debility from the inability to swallow food.

The effects of ulceration are also frequently very unpleasant, in the way of destruction of tissue, adhesions, contractions, &c. I have recently seen a case in which the throat was one large chasm, with thickened bands along its walls, all trace of its various parts having disappeared. Of course, under these circumstances, swallowing is very difficult, and the voice is permanently altered.

TREATMENT.—*Local.* For most ulcerations of the throat, nothing answers better than the frequent use of *chlorate of potash* as a gargle, or in the form of lozenges or spray. About two or three drachms to the pint is a convenient strength, and certainly as a rule this application produces excellent results. Follicular ulcers, and others of a chronic nature, often require to be freely touched with nitrate of silver or its solution. When the surface is sloughy, antiseptic gargles must be abundantly employed, such as those containing Condy's fluid, carbolic acid, creasote or chlorine, and they may be used alternately with the chlorate of potash gargle.

In bad cases it is advisable to start by brushing the surface over carefully with nitric or hydrochloric acid, and then proceed with the other applications. Disinfectant inhalations, such as those containing carbolic acid or creasote, are also very valuable.

General.—It is very important at the outset to determine whether there is any syphilitic taint which is the cause of the ulceration. If such is the case, a mixture containing iodide of potassium with decoction of cinchona bark, generally produces much improvement. Sometimes a mercurial course is required, but it must be conducted with care. It will often be found, even in syphilitic cases where there is much sloughing, that dilute nitric acid with decoction of bark brings about rapid improvement, and it is very useful in other forms of gangrenous ulceration. Tincture of steel, in 30 or 40 minim doses every four or six hours, is also exceedingly valuable, especially if there is much debility, and it may be combined with quinine. Chlorate of potash internally is recommended as a specific remedy in throat ulcerations. So far as my personal observation goes it seems to answer just as well if freely employed locally, but it may be also given as a drink. The sulpho-carbolates have been recently recommended by Dr. Sansom. In not a few instances one of the important matters to attend to is *the feeding of the patient.* It not uncommonly happens that, owing to difficulties in connection with swallowing, very little or no nourishment is taken, and hence the system is greatly lowered and healthy action cannot take place. Under these circumstances the patient must be compelled to take small quantities of beef tea and milk very often, so that a considerable amount of nutriment is consumed on the whole. If this is persevered in for a short time, the patient often is soon able to swallow easily, and there is a marked effect for good produced on the ulceration. At the same time a good quantity of port wine should be administered in similar small doses. If deglutition is really impossible, nutrient enemata must be administered.

It is necessary to allude to another point as regards treatment, viz., as to how to deal with those cases where there is much dyspnœa. These require most careful watching, as extraordinarily sudden death may occur from suffocation, and laryngotomy or tracheotomy may be called for at a moment's notice. Indeed in some of these cases it is decidedly advisable to open the larynx as a *precautionary measure*, so as to prevent any chance of sudden death, and at the same time to leave the ulcerated parts in a state of rest, and thus in a more favorable condition for undergoing the healing process.

CHRONIC AFFECTIONS OF THE THROAT.

CHRONIC PHARYNGEAL CATARRH.—When this condition exists, as it very commonly does, uneasiness or soreness is experienced, which is increased by irritating substances. The voice is husky, and there is a constant desire to clear the throat. Patients cough a good deal often, especially in the mornings, and have much difficulty in removing the secretion which forms. Examination reveals redness, frequently with permanent enlargement of the vessels, and the surface is not smooth, but presents a rough granular appearance (granular), or numerous enlarged follicles (follicular), or raised hard papules of a considerable size. Generally much thick sticky secretion is observed, and superficial erosions or ulcerations are frequently present, or follicular ulcers. This affection is often associated with disorders of the stomach, phthisis, and chronic alcoholism. It may be in many cases considered an indication of the condition of the general tract of the alimentary mucous membrane.

RELAXED MUCOUS MEMBRANE frequently is the cause of unpleasant throat symptoms, and it generally either follows catarrh, or is associated with a weak state of system. A quantity of secretion is seen on the surface, and cough is a common symptom, in order to get rid of it. When it is accompanied with a *relaxed and elongated uvula*, the sensations are still more uncomfortable. This often causes *chronic catarrh*, and gives rise to a constant tickling cough, which generally comes on severely when the patient lies down at night, owing to the uvula falling back and producing irritation. Nausea and vomiting may arise from it.

TREATMENT.—In treating these chronic throat affections, it is necessary first of all to find out the cause, and, if possible, remove this. Intemperance in drink, excessive smoking, the habitual use of hot spices and condiments in excess, too much speaking in public or singing, &c., must be put a stop to. If the alimentary canal is out of order it must be attended to. *Tonics*, such as quinine and iron, acids with bitter infusions, nux vomica or strychnia, frequently do much good.

Local treatment is attended with much benefit. Astringent applications are generally called for, in the form of gargle, glycerins or solutions applied with a brush, spray, lozenges, or powders. The best are alum, tannin, catechu, tincture of steel, sulphate of zinc, or nitrate of silver. They must be employed regularly and efficiently. As previously stated chlorate of potash is the most effective remedy if ulceration exists. It may be necessary to puncture follicles and then touch them with nitrate of silver, or to snip off an elongated uvula.

CHRONIC ENLARGEMENT OF THE TONSILS.—In many cases beginning during very early life permanent enlargement of the tonsils gives rise to serious results, and therefore, in examining children, it is desirable always to ascertain what the condition of their tonsils is, especially if they are rickety, tubercular, or strumous, as it is in such subjects that enlargement most commonly occurs.

Its *pathological causes* are: 1. *Chronic inflammation*, either following acute, especially after several attacks, or coming on gradually. 2. Persistent, or frequently repeated congestion. 3. Albuminoid infiltration.

SYMPTOMS.—*Deglutition* and *voice* are most affected. Breathing, however, is not uncommonly interfered with, and the report always is, "that the child makes a great noise when asleep," snoring loudly. The effect on the shape of the chest will be elsewhere considered, and is a matter of much importance. Deafness is not an uncommon symptom. On inspection the tonsils are seen to be enlarged to a greater or less degree, often meeting in the middle line. There is no particular redness, but the mucous membrane is not smooth, the surface appearing granular or irregular. Often white, opaque accumulations of secretion are observed. The tonsils feel hard. The *general health* is in most cases below par, and nutrition is interfered with, so that growth and development do not proceed properly.

TREATMENT.—All measures that tend to improve the health are indicated, hygienic, dietetic, and medicinal. Quinine, steel-wine, and cod-liver oil do much good often. A change to the seaside is very beneficial. *Locally* the *regular application* of *strong glycerin of tannin*, nitrate of silver, or tincture iodine may be tried, but generally these are quite ineffectual, and the tonsils have to be excised. When this is done it is necessary to see that they are quited healed afterwards, as they are apt to remain in a painful state for some time. If the chest is becoming deformed there should be no delay in removing the tonsils.

RETRO-PHARYNGEAL ABSCESS is very rarely observed, either as an acute or chronic affection, under the following circumstances: 1. As a complication or sequela of the acute specific fevers. 2. In pyæmia. 3. From local injury or disease, as in connection with caries of the cervical vertebræ or disease of the laryngeal cartilages. 4. Extremely rarely as the result of a primary inflammation.

SYMPTOMS.—These are pain at the back of the pharynx; much difficulty in swallowing, things returning by the nose; alteration in the voice; cough, and often great dyspnœa with a sense of suffocation. The abscess may be seen or felt in the pharynx, or it may form an external enlargement, and after a time fluctuation can be detected generally.

TREATMENT.—This consists in at once letting out the pus by careful incision and keeping up the patient by diet, stimulants, and tonics.

General Diagnosis of Throat Affections.

A few words will suffice on this subject, and to avoid unnecessary repetition, it may be summed up in some general remarks. As a rule the diagnosis is easy, especially if a careful examination is made. A difficulty is sometimes experienced in acute cases as to whether the affection is local or associated with scarlatina or diphtheria, and caution is advisable in giving an opinion, which should not be too hasty under such circumstances. The history of the case as to the supposed cause, whether there has been exposure to contagion or not, and the mode of invasion; the general symptoms present, with the degree of pyrexia, will afford much aid in the diagnosis.

It is also important to determine, especially in the case of ulceration, whether there is a syphilitic taint producing the morbid condition. From *laryngeal affections*, those involving the pharynx are distinguished by the absence or slight degree of dyspnœa as a rule, or its different character when present; by deglutition being more interfered with; by the voice being less altered or affected in a different way; by cough being a much less marked symptom and not having laryngeal characters; and, above all, by the results of examination. It must be remembered that some morbid states in the throat tend to spread to the larynx, or the parts may be involved together, each then giving rise to its own peculiar symptoms.

General Prognosis.

So far as danger to life is concerned, simple throat affections are not as a rule serious; if they give rise to much œdema or spread to the larynx they may become so by causing suffocation. Occasionally death from hemorrhage occurs in connection with tonsillitis, or with gangrenous ulceration. The latter condition, if extensive, may be very dangerous, and calls for a guarded prognosis. It is often exceedingly difficult to get rid of chronic diseases of the throat, or of the liability to repeated acute attacks.

CHAPTER IV.

AFFECTIONS OF THE ŒSOPHAGUS.

Clinical Characters.—Symptoms which seem to be connected with the œsophagus are not at all uncommon, but it is rare to meet with positive organic disease of this part of the alimentary canal. In most cases it is the seat of merely functional disorder; or occasionally something external to it interferes with its action. It is by no means easy to determine in chronic cases what the actual state of things is, and a very thorough examination may be necessary. The mode of investigating a case of supposed œsophageal disease, and the phenomena observed, may be thus stated: 1. Inquire as to the existence *of pain* or other *abnormal sensation*, as well as its seat, intensity, and character. Generally pain seems to be *deep*, as if between the shoulders, and is fixed in some spot. Other sensations usually complained of are those of fulness, tightness, oppression, burning, or obstruction by a foreign body. 2. Ascertain if there is *pain* or *difficulty* during *deglutition*. This symptom often requires much investigation with regard to its degree, and, when it seems to be great, if repeated efforts will enable swallowing to be accomplished; if it can be localized to any particular spot; whether it has come on gradually and steadily increased, or suddenly, and if it is constant, or only in paroxysmal attacks, associated or not with the taking of food; if it is influenced by the liquid or solid character of things swallowed, the size of solids, hot or cold substances, or special articles of diet; whether the act is aided by any particular position. 3. Substances are frequently *rejected*, and it is requisite to observe the manner in which this is effected, whether by mere regurgitation, spasmodic action, or vomiting; whether it occurs immediately after taking food, or in large quantity after an interval, as if materials had been accumulating for some time; as well as the nature and characters of the substances discharged, whether food, mucus, exudation, blood, pus, &c. As regards food brought up some time after having been swallowed, its reaction must be noticed, and whether it has undergone any digestive process, or is only macerated and decomposed, which is its condition if it has remained in the œsophagus, its reaction being alkaline.

4. *Physical Examination* is essential, which should include—*a.* A full inspection of the throat. *b.* The *passage of an œsophageal bougie.* This must be done cautiously of course, and by the use of this instrument we may get important information. (i.) It enables us to ascertain *if there is any actual obstruction*, as well as its seat and degree; also whether this is

constant and increasing, or only present from time to time, and if it can be overcome by continuous moderate pressure, yielding more or less suddenly. (ii.) Supposing obstruction to exist, the actual shape of the part may be known by making the bougie warm and soft, and thus getting a mould of the passage. (iii.) Frequently the bougie brings up materials on its surface, such as blood, pus, cancer-cells, &c., which should then be examined microscopically. (iv.) Occasionally the bougie may be felt to pass round something, such as a polypus. *c. Auscultation* is sometimes useful, for when the stethoscope is applied in the course of the œsophagus behind, and the patient made to swallow, a sound may be produced as if something were passing through a narrowed portion into a wider part beyond, should any obstruction be present. *d.* It is necessary to look for any swelling in the neck or elsewhere in the course of the gullet, which might indicate dilatation or sacculation of this tube, and to notice whether any such enlargement is influenced by taking food or drink, or by the act of vomiting or retching. *e* The neck and chest must also be examined thoroughly, to see if there is any tumor in the neighborhood likely to influence the functions of the œsophagus by pressure.

ACUTE ŒSOPHAGITIS.

ETIOLOGY.—Probably the gullet is often inflamed, without there being any particular symptoms calling attention to this condition. Œsophagitis may occur: 1. As a simple *catarrhal inflammation*, along with catarrh of other mucous membranes. 2. From direct injury by foreign bodies. 3. From irritation or corrosion by chemical substances, such as acids, alkalies, corrosive sublimate, also by very hot or cold articles. 4. By extension of *thrush, diphtheria*, or *croup*, when the characteristic deposits are met with. 5. As a complication of the acute specific fevers, cholera, pyæmia, &c. 6. In connection with organic disease, as ulcer, or stricture.

ANATOMICAL CHARACTERS.—There are the usual redness and swelling of the mucous membrane, with loss of consistence, and various deposits on the surface, according to the nature of the inflammation. Occasionally ulceration is seen, and superficial erosions commonly; while, if caused by corrosives, there may be much destruction of tissue. As a rare event, pus forms in the submucous tissue.

SYMPTOMS.—A more or less severe pain is felt deep down, along the course of the œsophagus, which may extend to the epigastrium. If there is ulceration, the pain is very great at the spot where this exists. *Deglutition* is difficult and painful, and things taken are ejected either immediately by spasm, or subsequently by vomiting, along with much mucus, or sometimes blood, pus, membranous shreds, or casts. If the case is serious, there may be great distress, and a sense of oppression about the chest. The general symptoms are of a febrile character, and there is a good deal of thirst. If the œsophagus is corroded or ulcerated, perforation may possibly take place, indicated by its special symptoms.

TREATMENT.—All that can be done is to let the patient suck ice freely, to give only liquid and mucilaginous diet in small quantities; or if there is corrosion, nutrient enemata should be employed, and the œsophagus left entirely at rest. Hot fomentations externally may afford relief, and it is often necessary to give opium.

Chronic Affections of the Œsophagus.

These are of much more consequence than the acute, and may depend upon *mere functional disturbance of the muscular coat; organic disease;* or *external pressure.*

I. Functional Derangements.

1. PARALYSIS.—This is met with only in certain nervous affections, viz., general paralysis of the insane; progressive muscular atrophy; some cases of brain disease; the paralysis which follows diphtheria; hysteria; or as a local paralysis, involving also the tongue and larynx. It is extremely rare.

SYMPTOMS.—There is only *dysphagia*, which is particularly felt with regard to liquids, these tending to pass into the larynx. *Solids*, and especially *large pieces*, are more easily swallowed, and the *erect posture* facilitates the act. The bougie can be passed quite readily.

2. ŒSOPHAGISMUS OR SPASM.—A slight degree of this is not at all infrequent, and sometimes it produces much distress, inducing complete obstruction.

ETIOLOGY.—The causes of œsophagismus are—1. Most commonly some nervous condition, especially hysteria and hypochondriasis. 2. Brain-disease very rarely. 3. Local irritation, especially that of an ulcer. 4. Occasionally dyspepsia with flatulence. 5. External pressure on the nerves of the œsophagus. 6. Intemperance.

Symptoms.—There may be a constant feeling of obstruction in some fixed point, and as if a foreign body were impacted, but pain is absent, unless an ulcer exists. When food is taken *sudden dysphagia* comes on, and there is a stoppage at some spot, either absolute and complete, or yielding after several efforts have been made to swallow, and this often occurs equally suddenly. The attacks may not always come on, and at times deglutition may be effected comfortably. It is often influenced by the nature and temperature of the food. Usually much discomfort is felt during the attempts at swallowing, with a sense of oppression or suffocation, and sometimes spasmodic movements of the muscles of the neck are produced. On passing a bougie it is stopped, but after careful, continued pressure, the spasm gives way, sometimes suddenly, and the instrument passes on. In the cases which have fallen under my notice, the upper part of the canal was affected, but the lower end may be involved. Dyspeptic symptoms are frequently complained of, and especially flatulence and eructations, which may bring on the spasm. There is no sign of wasting or serious organic disease as a rule, but generally distinct evidence of hysteria or hypochondriasis. If a tumor exists, causing pressure on the nerves, it will probably yield physical signs of its presence.

II. Organic Diseases.

1. Chronic Ulceration.—An ulcer is occasionally seen in the œsophagus, having the same characters as those to be hereafter described in connection with the stomach. It is liable to rupture, and cause perforation.

Symptoms.—As a rule, much localized pain is experienced of a burning character. Deglutition is very painful and difficult, or impracticable, chiefly on account of spasm. Blood and mucus are expelled, or brought away on the bougie. Great care must be exercised in using this, if an ulcer is supposed to be present.

2. Stricture and Obstruction.—The gullet may have its

passage permanently narrowed or completely closed from (i), *organic changes in its walls;* (ii), *external pressure;* or (iii), *a tumor projecting inwards from the walls, or from outside.* So far as the symptoms are concerned, these may be considered together, but first it is necessary to give a list of the causes of each condition.

(i.) *Organic Changes.*—These are: *a.* Cancerous infiltration. *b.* Cicatricial thickening and contraction after wounds, ulcers, or corrosive action. *c.* Hyperplasia of the coats, especially the submucous cellular tissue, or exudation and thickening, as the result of chronic inflammation. *d.* Syphilitic growths. *e.* Ulceration with induration and swelling of the margins of the ulcer.

(ii.) *External pressure* may originate in—*a.* An enlarged thyroid gland. *b.* Enlarged lymphatic glands in the neck or chest. *c.* Various tumors or growths in the neighborhood, such as cancers, fibrous tumors, exostoses, &c.; also aneurisms and abscesses. *d.* Great distension of the pericardium by fluid.

(iii.) *Projecting growths* are generally cancerous, fibrous, or of the nature of polypi.

RESULTS.—Dilatation of the gullet is produced after a time above the seat of obstruction, with muscular hypertrophy, and in this distended part food is apt to accumulate, causing irritation, ulceration, and sometimes perforation. The mucous membrane is also liable to ulcerate at the point of stricture. Below this the tube becomes narrowed and atrophied usually.

SYMPTOMS.—*Dysphagia* is the chief symptom, and there is a feeling that the food stops always at a certain spot, which is, in the great majority of cases, behind the upper piece of the sternum. At first it is only slight, but increases, usually slowly, so that at last nothing whatever will pass. Liquids and soft pulpy substances are far more easily swallowed than solids, especially when these are in large pieces, hence the patients learn to chew their food thoroughly. If a good-sized lump can be got through the obstruction, however, things then pass more readily for a time. Food is either immediately regurgitated, or spasmodically rejected, or it is retained in a dilatation for some time, and then a large quantity discharged. It is almost always alkaline, proving it has not entered the stomach, as well as sodden and decomposed.

A good deal of mucus is brought up, and sometimes blood, or pus, if ulceration exists. As to *pain*, frequently none at all, or very little exists; but if cancer or an ulcer is present, it is commonly severe. A sense of pressure and weight in the chest is often complained of.

The use of the bougie gives accurate information as to the actual existence, position, degree, shape, and rate of progress of the stricture. It may also reveal its cause, by the substances it brings up. Auscultation may give some aid.

If the obstruction is near the lower end of the œsophagus, the symptoms may be very similar to those present in stomach disease.

In proportion to the difficulty of taking nourishment will be the degree of emaciation and weakness, which is generally extreme. The abdomen becomes greatly retracted, and, in short, the patient shows all the signs of starvation, at the same time being often very hungry and thirsty. A tumor, as a rule, gives rise to symptoms of pressure on surrounding structures, which will be again described, as well as to external physical signs.

3. CANCER.—It is desirable to make a few additional remarks on this disease. Males and persons of advanced years are the subjects in whom it usually occurs, but it is an extremely rare affection.

ANATOMICAL CHARACTERS.—The *upper* end is involved in most cases, then the lower, and only very exceptionally the middle part. All forms of cancer are met with, the epithelial variety being most frequent above, and the scirrhus near the cardiac orifice; it may infiltrate the coats and extend through the entire circumference, or form a distinct tumor. The affected part is thickened, constricted, hard, and irregular, and ulceration of the mucous surface may occur. Above there is dilatation. The submucous tissue is that in which the formation is first observed. The glands in the neighborhood are generally cancerous, but other organs are not often affected.

SYMPTOMS.—In addition to those pointing to obstruction, there is much pain, generally localized, but also shooting along the side, upwards, or backwards between the scapulæ. The bougie may bring up cancer-cells, or these may be rejected. Signs of pressure usually exist, especially dyspnœa. There are symptoms of indigestion, with pyrosis, eructations, &c., and these may be present for some time before any local signs occur. Great wasting and debility are generally observed, with œdema of the legs, and the cancerous cachexia may be well marked. These cases rarely last long, the average duration being about thirteen months.

4. DILATATION OR POUCHING.—This may affect the whole circumference, or form a hernia or sacculation on one side. It arises from—(i.) Some obstruction most commonly. (ii.) Lodgment of a foreign body. (iii.) Paralysis from chronic catarrh. (iv.) No evident cause. It may form a tumor in the neck, affected in its size and other characters by taking food or drink, or by vomiting. Substances collect in it for a time, and are then discharged.

5. PERFORATION.—The œsophagus may be perforated from within out, or from without in. Ulcers, cancer, corrosive destruction, or injury by a foreign body are the causes of the former; aortic aneurism, abscesses, glandular or other tumors, of the latter. The perforation may take place into various parts, and the symptoms will vary accordingly.

GENERAL DIAGNOSIS OF CHRONIC ŒSOPHAGEAL DISEASES.—When a case occurs in which symptoms point to the œsophagus, the diagnosis has to determine: 1. Whether this tube is organically affected or only functionally, or is disturbed by some neighboring growth. 2. The nature and origin of the disease—if organic, whether cancerous, &c.; if functional, whether of the nature of paralysis or spasm. 3. The *seat* of the morbid condition, as regards the part of the tube involved.

In order to arrive at a correct diagnosis, we must take into account: 1. The history of the patient and his family, and the conditions as regards age, &c., as well as the history of the complaint, with respect to its cause, previous duration, and course. 2. The general state of the patient, especially as to the degree of emaciation and debility, and the presence of any diathesis. 3. The degree, characters, and situation of the local symptoms, particularly with respect to *deglutition*, from which much information may be gained. 4. The knowledge conveyed by the use of the *bougie*, which is often very accurate and decisive, as well as by the other modes of "physical examination," especially to determine whether tumors exist in the vicinity. 5. If any signs of adjacent pressure are present. 6. *The state of the nervous system.* 7. The condition of the stomach. 8. The progress of the case.

Space will not allow me to consider these points with reference to each disease, but the descriptions already given will indicate in what respects they differ.

PROGNOSIS.—*Spasmodic affections* are not dangerous as a rule, but they are often exceedingly difficult to cure. *Paralysis* is very serious in most cases, as it is a part of some grave nervous disease. All *organic diseases* are grave. In *ulceration* the chief danger is from perforation, or from stricture after healing. Every form of obstruction involves an unfavorable prognosis, and when cancer exists a speedy termination to the case may be foretold. In some conditions which cause obstruction, the prognosis depends partly on the results of treatment.

TREATMENT.—1. The general condition of the patient must be attended to. If a hysterical state exists, asafœtida, aloetics, iron, and valerianate of zinc are indicated. In the serious nervous disorders, strychnine and electricity are most useful, but generally no good can be done. Proper dieting is most essential if there is any real obstruction; liquid or pulpy nourishing food must be administered in sufficient quantities, and the patient may be fed at intervals through a stomach-pump. At last, nutrient enemata have generally to be used, and, if ulceration exists, they are decidedly indicated early, so that the ulcer may not be irritated. Any special diathesis, such as syphilis, must have its appropriate remedies. Dyspeptic symptoms require to be attended to frequently. The strength must be kept up by tonics, cod-liver oil, and stimulants, as well as by food. 2. External local applications sometimes do good in œsophagismus, such as a blister over the sternum, a belladonna plaster, or the use of some liniment. Probably these act through the mind. Nothing of this kind has any influence in the other conditions. 3. The *bougie* is most valuable in treatment, as well as in diagnosis. The *threat of it* sometimes does good in spasmodic cases, and its regular use often produces much improvement. In this way we can often dilate strictures, but great care must be exercised in doing this, especially if there is an ulcer present. 4. Various *symptoms*, such as pain, sleeplessness, or vomiting, frequently call for special remedies, in the way of opium, morphia, or other narcotics, local heat, ice, &c. 5. In some instances the advisability of performing œsophagotomy or gastrotomy might be considered.

CHAPTER V.

PHYSICAL EXAMINATION OF THE CHEST.

Before proceeding further, it will be expedient to enter upon the consideration of the *physical examination of the chest, and of some portions of the respiratory and circulatory systems not contained in this cavity.*

This is a subject of the deepest importance, as upon a practical acquaintance with it depends, in a large number of cases, our ability to arrive at a correct diagnosis. The limits of this work compel brevity, and hence, while attempting to point out all facts of importance, it will be impossible to enter into lengthy detail, and, in many parts, it will be necessary to have recourse to mere enumeration.

There are some general practical hints to which it is desirable to call attention before alluding to the different methods of examination. 1. A knowledge of the anatomy and physiology of the thorax and its contents is most essential, before "physical examination" can be applied to the investigation of any morbid condition in connection with them. It is also requisite to be acquainted with the normal "physical signs" (it being borne in mind that these are influenced by the liver and spleen, which invade upon the limits of the chest), and hence students should first practice examining healthy individuals. 2. When investigating for disease, the chest should be exposed to the full extent that any individual case may require. It is often necessary to strip the upper part of the body completely, and in males and children there need be no hesitation about doing this. The practice of examining through garments is, as a rule, most objectionable. 3. The patient should assume an appropriate position, the object aimed at being to place the superficial structures under such conditions that they will not interfere with the production or perception of the signs, and to enable the operator to conduct the examination in a comfortable and unrestrained attitude. In ordinary cases, the patient may sit or stand, upright and steady, with the hands hanging down by the side, while the front of the chest is being examined. A slightly stooping posture, with the arms well folded across the chest, is the best for examining the back.

constant and increasing, or only present from time to time, and if it can be overcome by continuous moderate pressure, yielding more or less suddenly. (ii.) Supposing obstruction to exist, the actual shape of the passage may be known by making the bougie warm and soft, and thus getting [illegible] mould of the passage. (iii.) Frequently the bougie brings up material on its surface, such as blood, pus, cancer-cells, &c., which should then [illegible] examined microscopically. (iv.) Occasionally the bougie may be felt to pass round something, such as a polypus. *c. Auscultation* is sometimes useful, for when the stethoscope is applied in the course of the œsophagus behind, and the patient made to swallow, a sound may be produced as if something were passing through a narrowed portion into a wider part beyond, should any obstruction be present. *d.* It is necessary to look for any swelling in the neck or elsewhere in the course of the gullet, which might indicate dilatation or sacculation of this tube, and to notice whether any such enlargement is influenced by taking food or drink, or by the act of vomiting or retching. *e.* The neck and chest must also be examined thoroughly, to see if there is any tumor in the neighborhood likely to influence the functions of the œsophagus by pressure.

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SYMPTOMS.—A more or less severe pain is felt deep down, along the course of the œsophagus, which may extend to the epigastrium. If there is ulceration, the pain is very great at the

II. *Regions.* These may be arranged in the form of a table.

A. *Anterior*, including the front of the chest, as far as the acromial line on either side.	1. *Median*, corresponding to the width of the sternum.	a. *Supra-sternal*, corresponding to the depression above the sternum.
		b. *Upper sternal*, extending to the lower border of the third cartilage.
		c. *Lower sternal*, from the third cartilage to the lower end of the sternum.
	2. *Antero-lateral*, bounded internally by the margin of the sternum, externally by the acromial line on each side.	a. *Supra-clavicular*, including the space above the clavicle, and bounded superiorly by a line from the outer part of this bone to the trachea.
		b. *Clavicular*, corresponding to the inner half or two-thirds of the clavicle.
		c. *Infra-clavicular*, limited below by the lower margin of the third rib.
		d. *Mammary*, from the third rib to the sixth.
		e. *Infra-mammary*, from the sixth rib to the lower margin of the thorax.
B. *Lateral*, bounded in front by the acromial line, behind by the axillary border of the scapula.		a. *Axillary*, from the apex of the axilla down to a line continuous with the lower boundary of the mammary region.
		b. *Infra-axillary*, from the above line to the lower margin of the thorax.
C. *Posterior*, from the axillary edge of the scapula to the middle line behind.		a. *Supra-spinous*, or *superior scapular* corresponding to the supra-spinous fossa of the scapula.
		b. *Infra-spinous*, opposite the infra-spinous fossa.
		c. *Infra-scapular*, below the scapula to the margin of the thorax, and extending to the spine.
		d. *Inter-scapular*, including the space between the base of the scapula and the spinous processes of the corresponding dorsal vertebræ.

METHODS AND OBJECTS OF PHYSICAL EXAMINATION.—It is necessary to have a clear comprehension of the different methods of examination employed with regard to what they are, how each is performed, and what it is capable of teaching; therefore a brief outline of this part of the subject will now be given.

I. Inspection.—This merely means "the act of looking," and all that need be said about it is, that different views of the chest must be taken from the sides and behind, as well as in front, a good light being employed. By this means we ascertain—1. The state of the superficial parts, as regards color, œdema, amount of fat, &c. 2. The shape and size of the thorax as a whole; the comparative dimensions and form of its two sides; and any local alterations, such as bulging or depression, or any distortion. At the same time, the state of the supra-sternal and supra-clavicular depressions, the direction of the ribs, the characters of the intercostal spaces, and the size of the costal angle (*i. e.*, the angle between the ensiform cartilages and contiguous rib-cartilages on each side), may be noted; as well as any difference in the height of the shoulders, or other peculiarity. 3. The frequency, extent, and characters of the respiratory movements, both general and local. 4. Certain points about the impulse of the heart. 5. The amount of pulsation in the great arteries of the neck, or the existence of abnormal pulsation. 6. The condition of the superficial veins, as well as of the large veins in the neck, especially the *right external jugular.*

II. Palpation or Application of the Hand.—The palmar surface of the hand is applied to the chest, in order to appreciate certain impressions which can be conveyed by the sense of touch. In some cases it may be necessary to grasp the sides, particularly in children; in others only the tips of the fingers need be used, but generally it is best to feel with as much of the hand as can be applied, except when it is desired to localize signs. By palpation we learn—1. The size and shape of the chest more accurately than by inspection. 2. All about the respiratory movements, especially local. 3. The existence and characters of various kinds of *fremitus.* This term includes different sensations conveyed to the surface, and produced in the following ways: (i.) By the act of speaking, which causes more or less palpable vibration, called *vocal fremitus;* in children, *the cry* answers the same purpose. (ii.) By coughing, named *tussive fremitus.* (iii.) By the passage of air during the act of breathing through tubes under certain physical conditions, termed *rhonchal fremitus.* (iv.) By the rubbing together of the surfaces of the pleura or pericardium, roughened by the deposit of much lymph, named *friction fremitus.* 4. The precise characters of the cardiac impulse. 5. The state of the large arteries of the neck, and the characters of any abnormal pulsation which may exist, whether visible or not; as well as certain points about the veins of the neck. 6. The presence of any fluctuation, or succussion movement.

III. Mensuration or Measurement.—In some cases it is important to get accurate information as to the size and shape of the chest, either general or local, and as to the extent of the respiratory movements; this is obtained by taking certain measurements, while the chest is at rest, and in different states as regards expiration and inspiration.

Those required as a rule are: 1. *Circular or circumferential* in different parts of the chest. 2. *Semicircular*, so as to compare the two sides. 3. *Antero-posterior*, both in the middle line and on either side, especially under the clavicles, and *transverse*, noticing the relations of these two diameters. 4. *Vertical*, from the middle of the clavicle to the lower margin of the thorax. 5. *Local measurements*, from the nipple to the mid-sternal line, and to the clavicle, on each side. The instruments that are necessary to carry these out include an ordinary tape-measure; a double tape-measure made by uniting two so that they start from the same point, which is useful for comparing the two sides, the point of junction being applied to the middle line behind, and the tapes drawn round, one on each side of the chest, until they meet in the mid-sternal line; different movable calipers, by which the diameters are taken. Several instruments have been invented in order to indicate the movements very precisely, but, for various reasons, they are not much employed.

In some instances it is essential to get an outline of the shape as well as the size of the two sides of the chest in different parts, in order to determine the exact capacity of each, as this depends much on the form, the measurement being sometimes actually less on the side which has the larger sectional area and volume. This is accomplished by means of the *cyrtometer*, a convenient form of which consists of two portions of flexible lead-tubing, of small calibre, united by a short piece of india-rubber tubing. The latter is fixed over the spine, and the two parts are brought round the sides as far as the middle line in front. When the instrument is removed it indicates the shape as well as the size of each side, and the outline may be traced on paper. Another mode of examination, which may be classed under "measurements," is that by which it is sought to ascertain the actual capacity of the lungs This is done by the aid of some form of "spirometer" usually, in the manner described in works on Physiology. At present this instrument is more of physiological interest than of practical value in diagnosis.

IV. Percussion.—By this is meant "the act of striking the chest," and it affords signs of the highest value in diagnosis. There are two ways of performing it, viz., 1st, by striking the chest immediately, nothing being interposed, which is called *immediate* percussion; 2dly, by placing something on the chest, named a "pleximeter," and percussing over this, which is termed *mediate* percussion. As a rule the latter mode should be employed, but the former is useful sometimes, especially when examining over bones, such as the clavicle. A great deal of discussion has been carried on as to the relative value of instruments or the fingers in percussion. Some use plates of ivory or other materials to place on the chest, and a light, flexible "hammer" or "plessor," to strike with. Other instruments are also employed, but without entering into any discussion on the subject, I venture to express the opinion that *the use of the fingers* *alone* is much preferable, and answers every necessary purpose. It is only by demonstration and practice that the art of percussing can be acquired. Still it is customary to give some account of the process, and a notion of it may perhaps be gained from the following description: 1st. The fingers of the left hand are used as a "pleximeter," especially the fore or middle finger, but sometimes all are so employed, and the little finger alone is conveniently applied when percussing above the clavicle. They must be laid on evenly and firmly, with the palmar aspect next the surface. 2dly. Percussion is then made with the ends of the fingers of the right hand, the nails being appropriately shortened. Some use all the fingers in this way, either in a line or made into a cone with the thumb; others only three, two, or one. It is well to practice all ways, but ordinarily the fore and middle fingers together answer best, or, in light percussion, the middle finger alone. 3dly. The force employed must vary according to circumstances, but usually it should only be moderate. 4thly. The stroke should, as a rule, be made perpendicularly to the surface, from the wrist, quickly and sharply, the fingers not being allowed to remain on too long.

By *percussion* we elicit—1. Certain sounds. 2. Different sensations as regards amount of resistance, elasticity, fluctuation, &c. These will be considered further on.

V. Auscultation.—This signifies the "act of listening," and it may be either *immediate* or *mediate*. In the former method, the ear is applied either directly to the chest, or with only the intervention of a handkerchief or towel. In the latter, the "stethoscope" forms a medium of communication between the part to be examined and the ear of the operator. For many reasons, this is the method to be practiced as a rule; but the *immediate* plan should not be neglected, as it is often advantageously adopted, especially in the examination of children, and in listening over the back. It is impossible to enter here into any discussion with regard to the innumerable stethoscopes recommended. A great deal more depends on the *ability to auscult*, and *the knowledge of what is to be heard*, than on the kind of instrument employed; and all that is required is to practice assiduously, and for a considerable time, with any of the ordinary stethoscopes that can be obtained. A convenient instrument is one made of a single piece of wood, such as deal or cedar, with a moderate-sized hollow stem, a well-fitting slightly hollowed ear-piece, and rather a small chest-extremity, which will fit into the intercostal spaces. In using it, care must be taken that the chest-end is applied in its whole circumference, and also that the ear is properly placed on the ear-piece.

Auscultation can only reveal the presence and characters of various sounds as a rule, though in some cases we are able, by means of the stethoscope, to realize certain movements produced by the heart and great vessels better than we can by palpation, through the sensations thus conveyed to the head. The *sounds* which are met with may be arranged thus:

A. *Sounds produced in connection with the respiratory organs.* 1. The respiratory or breath-sounds. 2. *Râles* or *rhonchi*, which are adventitious sounds, originating in the lungs from certain abnormal physical conditions, to be mentioned hereafter. 3. *Friction-sounds*, due to the rubbing together of roughened surfaces of the pleuræ. 4. Certain peculiar sounds, viz., *metallic tinkling*, *amphoric echo*, and the *bell-sound*, met with in some rare conditions of the lungs or pleuræ. 5. Those produced by the act of speaking or crying (*vocal resonance*), or coughing (*tussive resonance*).

B. *Sounds depending on Cardiac Action.* 1. The ordinary cardiac sounds. 2. Abnormal sounds, named *endocardial murmurs*, produced usually by morbid conditions in connection with the orifices and valves. 3. *Pericardial murmurs* or *friction-sounds*, depending upon roughness of the surfaces of the pericardium.

C. *Sounds in Connection with the Great Vessels of the Chest and Neck, and occasionally with the arteries generally.* 1. *Arterial sounds* and *murmurs*, which may even be observed in the smaller arteries. 2. *Venous murmurs.*

D. It must be mentioned that sounds may also be originated, especially during the act of breathing, by the contraction of muscles, the presence of air and fluid in the mediastinal cellular tissue, or by roughness of the surface of the liver.

VI. SUCCUSSION.—Rarely required, this simply means "shaking the patient," when a *splashing sensation* is felt, or a *sound* heard in some cases where a mixture of air and fluid exists in some large cavity, such as that of the pleura or pericardium.

VII. DETERMINATION OF THE POSITION OF ORGANS, WITH THE VIEW OF DETECTING DISPLACEMENT, is ordinarily ranked as a "method of examination," but in reality this is merely a conclusion founded on the information derived from some of the other modes already considered. At the same time it must be remarked that *displacement of organs*, both thoracic and abdominal, does often give most valuable aid in the diagnosis of abnormal conditions.

VIII. In the examination as to the state of the heart and vessels, two special instruments are now employed, viz., the *sphygmograph* and *cardiograph*. The latter has scarcely been used as yet to an extent to make it available for ordinary practice; the former is an important instrument, and will be further considered in its proper place.

Certain other modes of examination have been employed, but at present they have not been studied sufficiently to make them practically useful, and therefore it is not desirable to allude to them. The "physical signs" will now be considered briefly in detail.

I. SHAPE AND SIZE OF THE CHEST.

These are ascertained by *inspection*, *palpation*, and *measurement*. They may be considered together, as there is generally a near relation between them, the thorax being larger as a rule, the more it approaches the circular form; while both depend considerably on the direction of the ribs, and on their relation to each other. In healthy children, the thorax is comparatively large, and nearly circular; in adults it is more or less elliptical usually during ordinary breathing, the long diameter being transverse. However, many diversities of form may be observed within the range of health, and though there ought to be no obvious want of symmetry between the two sides, slight differences are generally present.

DEVIATIONS FROM THE NORMAL NOT DUE TO EXISTING DISEASE.

1. The thorax may be *small and contracted*, this condition being either congenital or acquired. Two forms are described, viz., *a. Alar or winged*, in which the ribs are very oblique and the spaces wide; the chest appears long, and narrow in all its diameters; the costal angle is very acute; and the scapulæ are tilted up behind like wings. *b. Flattened*, the front of the chest being flattened, so that there is a very small antero-posterior diameter.

2. Some important deformities of the chest are produced in infancy and childhood, as the result of an insufficient amount of air entering the lungs during the act of breathing. These are due either to some obstruction existing in the air-passages, or to a weak condition of the muscles which expand the chest, or to both combined, and they are more liable to occur in proportion to the yielding nature of the thoracic walls. Under these conditions, when an inspiration is made, sufficient air does not reach the lungs to enable them to fill up the vacuum produced, and the chest is driven in to a greater or less degree by atmospheric pressure outside, being partly drawn in also by the action of the diaphragm, and possibly of other muscles. The usual causes of obstruction are *chronic enlargement of the tonsils*, *laryngismus stridulus*, *croup*, *hooping-cough*, and *bronchitis*.

Four deformities of the chest are included in this class.

a. Transversely constricted. This is a very frequent deviation from the normal, the lower part of the chest in front presenting a more or less deep groove or depression, passing obliquely outwards and downwards from the ensiform cartilage.

b. Pigeon-breast. Here there is a falling in of the true ribs on each side, so that they become more or less straight in front of their angles, while the sternum is projected forwards. Hence a transverse section of the chest would be triangular, with the base behind, opposite the angles of the ribs, and the apex in front. The ensiform cartilage is also frequently bent sharply backwards, at its junction with the sternum, where there is therefore an angular prominence. More or less transverse constriction usually exists.

c. Anteriorly depressed. Occasionally the part of the sternum below the third cartilages is considerably depressed, so as to present a more or less deep concavity, carrying with it the contiguous portions of the rib-cartilages. In some instances this deformity is congenital, but not always.

d. Rickety. The true rickety chest is very characteristic. It is quite flat posteriorly as far as the angles of the ribs, where there is a marked bend; on each side runs a longitudinal groove, which may extend from the first to the ninth or tenth ribs, but is most marked about opposite the fifth, sixth, and seventh, and corresponds to the line of junction of the ribs with their cartilages, this being the most yielding part, and here nodular swellings may be felt. In front of this the cartilages are more or less curved, and the sternum somewhat prominent. The greatest lateral diameter of such a thorax is opposite the angle of junction between the dorsal and lateral regions, and the shortest at the bottom of the lateral depressions. The solid organs underneath will influence the form of the rickety chest.

3. The chest may be deformed as the result of *occupation, the pressure of stays or belts*, or *injury or disease of the ribs and spine.*

CHANGES IN SHAPE AND SIZE DUE TO EXISTING DISEASE.

1. *General enlargement*, involving both sides. In this condition the chest becomes more or less expanded, approaching to the form and size it presents after a deep inspiration, or even going beyond this, so as to assume a "barrel-shape." The enlargement may involve the whole length of the thorax, or only its upper part. *Causes. a. General emphysema* usually. *b. Extreme double pleuritic effusion* very rarely.

2. *General Diminution.* This is the opposite of enlargement, and the chest may assume either the *alar* or *flattened* form. *Cause. Phthisis*, but the two sides are rarely quite equally contracted, and there are generally local depressions in this disease.

3. *Enlargement of one Side.* Whenever this condition is supposed to exist, it is well always to take an accurate outline, both of the size and shape, by means of the cyrtometer. The affected side is usually more rounded, and appears short with a long antero-posterior diameter. The shoulder is raised and the spine curved to the opposite side. *Causes. a. In connection with the pleura.* (i.) *Pleuritic effusion* in the great majority of cases. (ii.) Occasionally pneumothorax or hydro-pneumothorax. (iii.) Very rarely hæmothorax. *b. In connection with the lung.* (i.)

Hypertrophy or distension when the opposite lung is rendered incapable from any cause, especially after pleuritic effusion or agglutination. (ii.) Secondary cancer.

4. *Diminution of one Side*, or *Retraction*. The characters are the reverse of those observed in enlargement, the entire side appearing small and cramped, with the ribs aggregated together. *Causes*. *a*. In most instances *pleuritic adhesions* and *thickenings*, binding down the lung so that it cannot expand. These may be produced as the final result of an acute attack of pleurisy, or may be gradually formed. In all cases of retracted side pleuritic adhesions are formed after awhile. *b*. *Collapse of the lung* from any cause. *c*. *Changes in the lung structure*, diminishing its volume and power of expansion. (i.) *Phthisis*. (ii.) Some cases of pneumonia, but especially *chronic* or *interstitial* pneumonia. (iii.) Primary cancer.

5. *Local Enlargement* or *Bulging*. This requires no description, and it necessarily varies much in its site, extent, and form. Accurate measurement may be required to determine it. *Causes*. *a*. *Conditions of the Pleura*. (i.) Collections of pus pointing on the surface. (ii.) Localized or basic pleuritic effusions. (iii.) Localized pneumothorax. *b*. *Conditions of the Lung*. (i.) *Pneumonia* at the base or apex. (ii.) A *large phthisical cavity* at the apex. (iii.) Localized emphysema. (iv.) Very rarely hernial protrusions. *c*. *Conditions of the Heart and Pericardium*. (i.) *Pericardial effusions*. (ii.) *Various enlargements of the heart*. *d*. *Aneurisms of the great vessels*. *e*. *Different mediastinal tumors*. Enlarged glands sometimes grow down from the neck and cause some bulging. *f*. *Enlargements of the liver or spleen*. *g*. *Sometimes disease of the sternum or ribs*, or *their investing periosteum*, as well as *superficial abscesses* or *tumors*.

6 *Local Diminution or Depression*. *Causes*. (i.) *Phthisis*, from the local changes in the lung, and the pleurisy to which it gives rise, especially in the supra- and infra-clavicular regions. (ii.) Pleuritic adhesions. (iii.) Pericardial adhesions, extending to the chest-wall.

7. With regard to the *costal angles* and *intercostal spaces*, the size of these ought always to be observed, and also whether the latter are flattened or bulged, should pleurisy or pericarditis exist. Anything that affects the size of the chest generally, or of either side, will necessarily influence that of the angles and spaces, and the latter will be also altered locally, in case any local bulging or depression is present.

Thus far it has been necessary to allude to other structures besides the respiratory organs, but in what follows attention will be confined to the latter for the present.

II. MOVEMENTS OF RESPIRATION.

These are measured by *inspection*, *palpation*, and *mensuration*, and when examining for disease it is necessary to observe them during ordinary and forced respiration.

Without entering into the physiology of the respiratory movements at any length, it will be advisable to call attention to the following practical points: 1. They are partly costal or thoracic, partly diaphragmatic or abdominal. The thoracic movements are made up, during inspiration, of elevation and expansion; during expiration, of depression and retraction. 2. In health there is no obvious difference in the movements of the two sides. 3. In males and children the diaphragm and lower ribs chiefly act, hence the movements are *abdominal*. In females the upper part of the chest moves most, and breathing is *upper costal*. 4. The ordinary rate of breathing is from 16 to 20 per minute. 5. Expiration is slightly longer than inspiration, in the ratio, it is stated, of 12 to 10 in males, 14 to 10 in females. 6 The intercostal spaces in most parts become rather more hollow during inspiration, and so do the supra-clavicular fossæ. This is especially seen when a deep breath is drawn, and is best observed towards the lower and lateral part of the chest. 7. *Inspiration* is entirely effected by muscular action; *expiration* chiefly by the elasticity of the lungs and chest-walls, aided somewhat by muscular force, which is more exercised in forced expiration.

MOVEMENTS IN DISEASE.—I. *Frequency*. The respirations may be counted either by watching the movements, or by applying the hand quietly over the epigastrium. Their frequency may be either increased or diminished.

1. *Increased. Causes. a.* Most conditions that interfere with the action of the lungs in any way, and produce any form of dyspnœa. *b.* Many cardiac affections. *c.* Certain nervous disorders. *d.* An unhealthy state of the blood, such as that present in anæmia, fevers, &c. 2. *Diminished.* A slow rate of breathing is often noticed in apoplexy, narcotic poisoning, and some nervous derangements, *e. g.*, trance, &c.

II. *General Movements affecting the entire act on both sides.* 1. *These may be in excess.* The patient breathes *deeply*, and with more force, the extraordinary muscles being brought into play, the range of movement is greater, and more air is changed. Under these circumstances respiration tends to become more *costal* in all persons. *Causes. a. Anything that interferes with the functions of the lower part of the lungs*, such as disease in itself, *e. g.*, pneumonia, congestion, œdema, bronchitis; accumulations in the pleuræ; or abdominal enlargements (ascites, enlarged liver, &c.). *b. Cardiac diseases* which interfere with the circulation of the blood, and hence with its proper aeration. *c.* Certain abnormal conditions of the blood itself, such as anæmia and chlorosis.

2. *General movements may be deficient*, and this deviation may be combined either with increased, normal, or diminished frequency. *Causes. a.* Anything that interferes *extensively* with the functions of the lungs, *e. g.*, capillary bronchitis, double pneumonia, or pleuritic effusion. *b. Painful affections about the chest*, *e. g.*, acute pleurisy or pneumonia, pleurodynia, intercostal neuralgia. *c. Rarely interference with the action of the muscles from spasm or paralysis. d. Certain conditions of the central nervous system*, *e. g.*, narcotic poisoning and trance. *e. Very rarely infiltration of the chest-walls with cancer.*

3. *The relation between the thoracic and abdominal movements may be altered.*

(i.) *Thoracic movements in excess from diminished action of the diaphragm.*

Causes. a. Usually something in the abdomen, mechanically interfering with the descent of the diaphragm, such as ascites, flatus, or tumors. *b. Conditions which render movement of the diaphragm or abdominal walls painful*, especially peritonitis, but also diaphragmatic pleurisy, rheumatism, and inflammation of the diaphragm or abdominal walls. *c. Extreme pericardial effusion*, chiefly acting mechanically. *d. Paralysis of the diaphragm* from any cause.

(ii.) *Diaphragmatic and abdominal movements in excess. Causes. a. All conditions which cause pain on bringing the chest-walls into play*, *e. g.*, pleurisy, pleurodynia. *b Paralysis or spasm of the chest muscles. c. Any obstruction in connection with the air-passages*, which prevents the proper entrance of air.

4. *The rhythm of the respiratory act may be altered. Unequal* and *jerky* breathing is often noticed in some nervous disorders, such as chorea and hysteria. The most important change in rhythm, however, is when the *relative length of inspiration and expiration becomes disturbed*, the former becoming more or less short and quick, and the latter prolonged, slowly performed, and often labored (*expiratory dyspnœa*). *Causes. a. Diminution in the elastic power of the lung-tissue*, which is particularly observed in *emphysema*. Expiration becomes then either entirely muscular, or far more so than in health. *b.* Some obstruction to the free passage of air through the principal air-passages.

5. *The obvious movements of the chest may be quite abnormal.* Instead of expanding during inspiration, the chest may fall in to a greater or less extent, especially at its lower part, and in the supra-clavicular regions, producing, either temporarily or permanently, one of the forms of deformed thorax, already described (*inspiratory dyspnœa*). It is in children that this deviation is chiefly observed. *Causes. a. Almost always some obstruction to the entrance of air into the lungs.* The immediate conditions which produce this obstruction are: (i.) Enlarged tonsils, or other impediment about the pharynx. (ii.) Anything tending

to occlude the larynx or trachea, *e. g.*, croup, œdema glottidis, laryngismus stridulus, pressure of tumor or aneurism. (iii.) *Bronchitis.* (iv.) Hooping-cough. *b.* Occasionally, it is said, very rapid œdema of the lung or hydrothorax.

III. *Unilateral Movements.* 1. *The respiratory movements may be unequal in extent on opposite sides.* This is due usually to *deficient expansion* of one side, which may amount to absolute cessation of movement, the other acting normally or in excess. *Causes.* *a. Accumulations in one pleural cavity, or adhesions,* preventing the lung from becoming distended. *b. Changes in the lung-tissue on one side*, producing consolidation, and thus interfering with its inflation, *e g.*, acute or chronic pneumonia, phthisis, cancer. *c. Pressure on either chief bronchus,* by a tumor, air being thus prevented from getting into the lung. *d. Painful affections of one side.* *e. Unilateral paralysis of the muscles* occasionally.

2. *The relation of the abdominal to the thoracic movements* may certainly be unilaterally altered, but this is not often observed, and is not of much consequence.

3. *Unilateral inspiratory dyspnœa* is occasionally seen, from obstruction of a bronchus.

IV. *The ratio between the expansion and elevation movements of the ribs may be altered.* The only important deviation in this respect is a diminution in the expansion-movement, which may amount to its complete absence It is especially observed during forced breathing, when there may appear to be considerable movement, but none of the expansile kind. *Causes.* *a. General emphysema*, the lungs being already distended, and the chest expanded. *b.* Anything in the lungs themselves, or outside, that either prevents them from acting, or interferes with the entrance of air, *e. g.*, consolidations, pleuritic accumulations or adhesions, pressure on the air-tubes.

V. *The movements of the intercostal spaces may be affected.* In pleuritic effusion, pneumonia, and other conditions which affect the movements of the chest, the spaces frequently do not exhibit their usual changes of form during the act of breathing, and, in some instances of extreme pleuritic effusion, an undulatory motion is noticed.

VI. *Local changes in movement.* 1. The common deviation met with is a *local deficiency*, in which both expansion and elevation are involved, but especially the former, and, at the same time, the spaces are often motionless. The usual causes of this change are *phthisis*, and *limited pleuritic adhesions.*

2. Occasionally a *limited falling-in* during inspiration occurs, in connection with obstruction of one of the smaller bronchial divisions.

III. Examination of Various Kinds of Fremitus.

I. *Vocal and Cry-fremitus.* This is determined by applying the hand to the surface while the patient repeats the words "ninety-nine," or counts from one to ten. As already remarked, the cry answers the same purpose in children. The normal variations due to the quality of the voice, age, and sex, state of the chest-walls, and the part of the chest over which the examination is made, must be borne in mind. As a rule, *vocal fremitus* is more marked on the right than the left side, especially over and below the clavicle.

In disease it may be altered in *area* and in *amount.*

1. *Area.* This may be (i.) *increased* in distension of the lungs from emphysema or hypertrophy. (ii.) *Diminished* from retraction of the lung by adhesions, or its being pushed aside by some solid mass, such as an enlarged heart.

2. *Amount.* (i.) *Increased. Causes. a.* Consolidation of the lung from any cause, provided the consolidating material is not too abundant, or too hard or pulpy, and incloses tubes containing air. Fremitus is especially marked, if, at the same time, the bronchial tubes are dilated, or if cavities of certain characters exist in the lungs. Ex—pneumonia, phthisis, chronic pneumonia with dilated bronchi, some cases of cancer, &c. *b.* Condensation of the lung by pressure or collapse. *c.* Bronchitis, congestion, or œdema of the lungs, pulmonary apoplexy, &c., in many cases, but not constantly, nor is vocal fremitus of much importance in these affections. (ii.) *Diminished or Suppressed. Causes. a.* Separation of the lung from the chest-wall by some intervening material, *e. g.*, *fluid or air in a pleural cavity*, enlarged organs or growths invading upon the cavity of the thorax. *b. Very extensive* and *dense or pulpy consolidation of the lungs*, with obliteration of the tubes, so that no air can enter, *e. g*, extensive soft cancer, some cases of phthisis, and pneumonia, with rapid and abundant exudation. *c.* Distension of the lung in emphysema, as a rule, but this is not of much consequence.

These changes in the amount of vocal fremitus may be very limited, or observed over a considerable part of the chest. It is at the base and apex of the lung that they are by far the most important, in distinguishing between *fluid effusion and pneumonic consolidation* at the base, and aiding in detecting phthisis at the apex. It is further to be noticed that on the same side both *increase* and *deficiency* may be observed in different parts, *e.g.*, in cases of pleuritic effusion the fremitus is often absent below, but in excess above, on account of the compressed state of the lung.

II. *Tussive Fremitus*—This is affected in much the same way as vocal fremitus, but it is of very little importance.

III. *Rhonchal Fremitus.*—When present it is of much value in indicating accumulation of secretion in the bronchial tubes, due to bronchitis or œdema, especially in the case of young children.

IV. *Pleuritic Friction-Fremitus.*—Not often met with; it indicates the existence of much firm deposit in connection with the pleura. It is most frequently observed during the later stages of acute pleurisy, but may be very marked in cases of chronic dry pleurisy.

IV. Physical Signs Obtained by Percussion.

Percussion-Sounds.

Sounds in Health.—Five different sounds may be obtained by percussion in a healthy subject, which differ in their degree of resonance, length, fulness, pitch, and clearness.

1. *Tympanitic* or *Drum-like.* In this country the term "tympanitic" is applied to the sound which is produced by percussing over the abdomen, where there is a good deal of gas contained within the intestines. *Characters.* It has considerable resonance, is of prolonged duration, low in pitch, full, and may be either more or less muffled, or clear, according to the state of distension.

2. *Pulmonary* or *Sub-tympanitic.* This is the sound obtained by percussing over the lungs, in a healthy condition, and is therefore present over the greater part of the chest. *Characters.* Possessing a fair amount of resonance, it is shorter, less full, and higher pitched than the "tympanitic" sound, and in ordinary conditions is muffled. It has been likened to the sound elicited by striking over a "muffled drum."

3. *Tracheal* or *Tubular.* As its name indicates, this sound is produced over the windpipe. *Characters.* Much less resonant than the previous sounds, it is also considerably shorter and of higher pitch; as a rule it is not clear, owing to the structures which cover the air-tube.

4. *Bony* or *Osteal.* It is not always possible to get this sound distinctly over any part of a healthy chest, but it gives its characters to other sounds, especially over the sternum and clavicles. It can be observed over any of the bony prominences in the body. *Characters.* With hardly any resonance, this is a very short, high-pitched, and tolerably clear sound.

5. *Dull* or *Non-resonant.* When percussion is made over solid organs and structures, the sound elicited is of this nature, being very short and abrupt, and it is supposed that each organ gives rise to a peculiar pitch of its own, but certainly very few are able to appreciate this.

Changes in the Sounds Produced by Disease.

When percussing the chest, with the view of obtaining evidences of disease in connection with the lungs, by the aid of the sounds elicited, we have to notice—1. Whether there is any *actual change in the charac-*

ters of the pulmonary sounds produced over the chest as a whole, or over any part of it. 2. If there is any increase or diminution in *the extent* over which the normal pulmonary sound is heard. 3. If there is the proper variation between the sounds produced after a full inspiration, and after a deep expiration, either generally or locally, both as regards characters and area. 4. If any difference is observed between the results of superficial and deep percussion.

1. CHANGES IN CHARACTERS OF PULMONARY SOUNDS.

A. *Resonant sounds. a. The percussion-sound may become extra resonant or actually tympanitic.*

Causes. (i.) *Pneumothorax* or *hydro-pneumothorax*, provided the amount of air in the pleura is not so great as to stretch the chest-walls very immoderately, when it is found that the sound becomes dull. (ii.) Certain states of the lungs, in which there is excess of air in proportion to solid tissue, with more or less distension, viz., *emphysema, hypertrophy, atrophy,* extreme bloodlessness. In these conditions the sound is *too resonant,* but rarely actually tympanitic.

b. Amphoric. This is a peculiar, very resonant sound, of a hollow, metallic character, only met with in rare instances, and generally depending upon the existence of a large cavity, containing air, and having tense walls.

Causes. (i.) A very large phthisical cavity in the lungs, near the surface, generally adherent, and having smooth, thin, but firm walls, with very little fluid contents. (ii.) Pneumothorax occasionally.

c. Tubular. This is not uncommonly met with in some part of the chest, but never over any great extent. It resembles the sound produced over the trachea, varying somewhat in its pitch, and usually being quite clear.

Causes. (i.) *Cavities in the lungs,* not too large, superficial, or having some firm, well-conducting tissue between them and the chest-walls, and containing little or no fluid. Such cavities are generally the result of *phthisis,* but may be due to *enlarged bronchi.* (ii.) *Accumulation of some solid material between the trachea* or *one of the main bronchi and the surface,* forming a good conducting medium, *e.g.*, any mediastinal tumor, but especially enlarged glands in the posterior mediastinum, the tubular sound being then heard in the interscapular regions, particularly in children. (iii.) *Certain conditions in which the lower part of the chest is invaded upon, so that the lung* is pushed or floated upwards, some believing it to be in a relaxed, others in a condensed condition; a tubular sound is then produced under the clavicle. This is observed in *pleuritic effusion* very often; occasionally in connection with tumors in the chest or enlarged abdominal organs, and consolidation of the lung itself, *e.g.*, pneumonia, &c.

d. Without any marked alteration in quality, *the ordinary pulmonary percussion-sound may become unusually clear*, *e. g.*, in some instances of bronchitis, congestion, œdema of the lungs, early period of pneumonia, &c. This is due to "liquid or solid being mixed intimately with air-containing tissue," and the sound under these conditions may even assume a tubular quality.

B. *Sounds in which resonance is more or less diminished to absolute dulness.* When this deviation from health exists, it is necessary to note the *degree* of the change, which may vary from a *slight deficiency in resonance* to the *most complete dulness;* its *situation* and *extent;* the *pitch* of the sound produced; the *form* of the dulness; and, in some cases, whether *alteration in posture* has any effect upon it. There are two *dull sounds* which call for special mention: 1. The *hard, wooden sound*, which is very short and abrupt, almost non-resonant, exceedingly high-pitched, and accompanied with a sensation of much resistance. 2. *Putty-like*, this being, as its name suggests, an absolutely non-resonant, dull, heavy, and dead sound.

Causes. It may be useful to enumerate all the causes which can give rise to abnormal dulness over the chest. (i.) *Certain affections of the chest-walls*, such as infiltrated cancer, diseased or inflamed bone and its results, periostitis. (ii.) *Accumulations in the pleural sac*, of serum, pus, or blood; or *its extreme distension with air.* (iii.) *Excessive solid or liquid materials in the bronchi, air-vesicles, or tissues of the lungs*, *e. g.*, *pneumonia*, *phthisis*, great congestion or œdema, abscess, extensive bronchitis, thickening and dilatation of the bronchi, cancer. (iv.) *Considerable collapse or compression of the lungs*, or, on the other hand, *extreme* distension. (v.) *Enlargements in connection with the heart*, or *solid or fluid accumulations in the pericardium.* (vi.) *Mediastinal enlargements* of all kinds, such as various tumors, enlarged glands, abscess, aneurism. (vii.) *Enlarged or displaced abdominal organs*, especially the liver or spleen, or, rarely, tumors extending upwards from the abdomen.

C. *Certain peculiar Sounds.* *a. Metallic.* This is a high-pitched sound, of a distinctly metallic quality, not unfrequently tinkling or splashing. It is not always easy to separate it from "*crack-pot sound*," and both may be produced in the same case, according to the force used in percussion, as they depend upon the same physical conditions, viz., a cavity containing air.

b. Crack-pot sound or *cracked-metal*, "*bruit de pot fele.*" Also metallic, it has further a cracked character, as its name indicates, and gives the idea of air being driven out through a chink or small aperture. It is imitated to some degree by clasping the hands loosely together, and striking them over the knee, so as to drive out the air from between them. It is produced in the chest by air inclosed between two surfaces, the anterior of which is yielding, being suddenly expelled through an orifice.

Causes. (i.) *A cavity in the lung*, of good size, superficial, containing air, having one or more bronchi opening into it, and its front wall being somewhat yielding. These conditions are best fulfilled by phthisical cavities at the apices of the lungs, hence the sign is most commonly observed in either infra-clavicular region. In order to elicit it, it is best to make the patient open his mouth and turn towards the operator, and percussion must be made firmly, but rapidly and abruptly. (ii.) When bronchitis exists in children, or even when very young infants merely cry, a sound resembling a "crack-pot sound" may be produced in many parts of the chest, but there is no difficulty in distinguishing this from that due to a cavity. (iii.) In rare instances this sign is present in front of the chest in cases of *pleuritic effusion*, or *consolidation of the posterior part of the lungs.*

2. CHANGES IN THE EXTENT OF PULMONARY RESONANCE.—*a. Increase.* When the lungs are distended with air an *increased area of resonance* may be the only deviation noticed, and it ought always to be looked for. The common cause of this distension is *emphysema*, but it may be due to *hypertrophy* or *temporary inflation.*

b. Diminution. It is not easy to separate this deviation from dulness, still it is an important sign of the lung being contracted within narrower limits than the normal.

3. EFFECTS OF INSPIRATION AND EXPIRATION UPON THE PERCUSSION-SOUND.—*a.* There may be *no extension*, or *increase in the amount of resonance, after a full inspiration*, either generally or on one side, and *no diminution in the same after a deep expiration.*

Causes. (i.) The lungs being already fully distended, and unable to empty themselves, *e. g.*, in emphysema. (ii.) Some obstruction to the passage of air in connection with the air-tubes, *e. g.*, bronchitis, spasmodic asthma. (iii.) The lung cannot expand, either from external pressure, such as pleuritic effusion or adhesions, or from extensive disease in itself. This only affects the results of inspiration. (iv) Combined with this inability to expand, there may be *air in the pleural cavity*, which cannot be increased or diminished in quantity.

b. In cases of suspected phthisis at the apex, where the signs are not marked, it is very important to notice whether there is a proper difference in the percussion-sounds, after a deep inspiration and expiration respectively, as regards amount and area of resonance and height of pitch.

4. DIFFERENCE BETWEEN SUPERFICIAL AND DEEP PERCUSSION.—This may be of much use in determinining the actual physical conditions present in a phthisical lung. Superficial percussion may give rise to much *hard dulness*, showing the presence of extensive consolidation; but on

deep percussion a *crack-pot sound* may be elicited, indicating the existence of a cavity within the consolidation.

SENSE OF RESISTANCE OR ELASTICITY.

When percussing, it is important to notice the sensation which is conveyed to the fingers. The information thus obtained is mainly useful—*a.* In making out the state of the chest-walls as to rigidity, excessive elasticity, distension by air, &c. *b.* In distinguishing between dulness due to fluid or some solid mass. *c.* In determining the amount and actual density of any solid accumulation.

V. PHYSICAL SIGNS OBTAINED BY AUSCULTATION.

RESPIRATORY SOUNDS.

SOUNDS IN HEALTH.—In health three typical sounds may be heard during the act of breathing, on listening over different parts of the respiratory organs.

1. *Tracheal* or *Laryngeal.* Heard on applying the stethoscope immediately over the windpipe in the neck, this sound has the following characters: It is very loud, harsh, hollow, and high-pitched; begins simultaneously with the act of inspiration, continues throughout, and is heard equally well during expiration; there is a marked interval between the inspiratory and expiratory sounds, the latter being rather the longer, louder, and higher pitched. This sound is laryngeal in its origin.

2. *Bronchial.* This differs from the former in not being hollow or so loud or high pitched; of a harsh quality; not quite so rapidly evolved; the interval between inspiration and expiration is not so marked, and the latter, though prolonged, is not so much so as in the "tracheal" sound. This is heard in the interscapular regions, and over the upper part of the sternum and contiguous end of the clavicle. It is the "laryngeal" sound, conducted along the larger bronchi.

3. *Pulmonary* or *Vesicular.* On listening over the greater part of the chest, a soft, breezy sound is heard during inspiration, gradually developed, but continuous; no interval can be observed between it and the expiratory sound, which is very much shorter and more feeble, but rather harsher and lower pitched; not infrequently it is quite inaudible. Some believe that the *pulmonary* sound is actually produced in the air-vesicles; others that it is either entirely or in part the laryngeal sound, conducted and modified.

Several conditions influence the breath-sounds in health, but only *age* and *sex* can be here alluded to. In children they are very loud and expiration is prolonged, this breathing being termed "puerile." In aged persons the sounds are weak, but expiration is usually lengthened. In females they are generally more marked, and often jerky.

Changes in the Breath-sounds over the Chest due to Disease.

I. Changes in Intensity.—1. *The breath-sounds may be more or less weakened until they are completely absent, either over a limited surface, over one side, or over the greater part or whole of the chest. In some instances they seem to be deep and distant.*

Causes. *a.* Anything that obstructs the entrance of air through the air-passages into the lungs, whether due to spasmodic constriction, internal obstruction, or external pressure. *b.* Imperfect respiratory movements, on account of pain, paralysis, or spasm of the muscles, or any other cause. *c.* Permanent distension of the lungs, which cannot expel the air which they contain; *e. g.*, emphysema. *d.* Any condition which prevents the lungs from expanding, by producing external pressure upon them; *e. g.*, *pleuritic accumulations of all kinds*, *old adhesions*, abdominal enlargements extending upwards, intra-thoracic tumors, &c. *e. Very extensive* or *very dense* consolidation of the lungs under certain circumstances; *e. g.*, extensive cancer, phthisical consolidation, pneumonia. *f.* In some conditions, such as œdema of the lungs or extensive capillary bronchitis, the respiratory sounds are completely obscured by "*râles.*"

2. *The respiratory sounds may be "puerile," being increased in intensity, the expiratory portion becoming then more marked.*

Causes. *a.* If one lung, or any portion of one or both, has to do extra work, in consequence of interference with the functions of the other lung or parts, the sounds become "puerile" over the healthy portions. This is observed in connection with pleuritic effusion or adhesions, consolidation of parts of the lungs, obstruction of a bronchus, &c. *b.* If a bronchus is suddenly relieved of spasm, the breathing becomes exaggerated over the portion of lung to which it passes.

II. Changes in Rhythm.—Many deviations in rhythm are described, but only two can be readily appreciated, so as to give practical information.

1. *The breath-sounds may become irregular, more or less jerky or wavy, so as sometimes to have a cogged-wheel rhythm, especially that of inspiration.* This is by no means a reliable sign of disease, especially in females, in whom it is often met with, particularly if they are at all nervous or hysterical, while it frequently depends upon an excited cardiac action. It is observed—*a*, in painful affections of the chest, such as early pleurisy or pleurodynia, when the patient breathes in a jerky manner; *b*, in the early period of phthisis; *c*, in connection with old pleuritic adhesions.

2. *The most important change in rhythm is a prolongation of the expiratory sound, so that it may be double, or even three or four times the length of that of inspiration, which often becomes actually shortened.* This always occurs when the breathing becomes at all of a bronchial character, but it may be the main or the only alteration observed.

Causes. *a. Emphysema.* The elasticity of the lungs being more or less diminished. *b. Obstruction to the exit of air* through the respiratory passages.

III. CHANGE IN THE EXTENT OVER WHICH THE SOUNDS ARE HEARD. —It is merely necessary to allude to this, as affording evidence of *distension of the lung* on the one hand, when it is *increased;* or *of retraction,* when it is *diminished.*

IV. CHANGES IN QUALITY, ALONG WITH OTHER CHARACTERS.—Some very important morbid breath-sounds are met with, which differ entirely from those ordinarily heard over the chest, in their quality, pitch, rhythm, and other particulars.

1. *Harsh or rough breathing.* As its name indicates, this merely implies a harshness of the sound, the soft, breezy character being wanting, which is especially marked during expiration, this being unduly lengthened. It is not very reliable as evidence of disease, but is frequently observed in connection with slight consolidations, bronchial catarrh, emphysema, the early period of pneumonia, and various other morbid conditions.

2. *Bronchial.* In its characters, this corresponds with the normal sound thus named, but it is heard in unusual regions, or is unusually marked.

Causes. *a. All forms of consolidation of the lungs, if moderate in amount, and contiguous to the surface, e. g.*, phthisis, cancer, chronic pneumonia, some cases of acute pneumonia. Even when *small cavities* exist in the lungs, or dilated bronchi, the breathing is often bronchial, provided sufficient solid material intervenes between them and the surface. *b. Condensation of the lung from pressure.*

3. *Blowing.* Though approaching on the one hand to "bronchial" breathing, and on the other to "tubular," this sound has sufficiently distinctive characters to merit recognition. It differs from the former in its markedly "blowing" quality, being clearer and higher-pitched; from the latter in being diffused, and not hollow or as if produced in a localized tube.

Causes. *a.* Diffused consolidations, not too abundant, *e. g.*, phthisis, and pneumonia. *b.* Small cavities or dilated bronchi, surrounded by solid material.

4. *Tubular.*—A high-pitched, concentrated, somewhat hollow and metallic sound, this resembles much that perceived over the trachea, and gives the impression of being directly conveyed from a tube.

Causes. *a. Acute pneumonia,* where it is of the most typical kind. *b.* Some cavities in the lungs. *c.* A solid mass intervening between the trachea or a main bronchus and the chest-wall, so as merely to form a medium of communication between them.

5. *Cavernous.* This is a clear, evidently hollow sound, varying in its

pitch, which tends to be low, especially during expiration. It is usually only perceived over a limited area, and gives the impression of being produced in a hollow space, its exact characters varying according to the dimensions of this.

Causes. *a.* *A cavity in the lung* of some size, superficial, and not containing much fluid. *b.* In rare instances, it is said, cavernous breathing may be heard when consolidation surrounds an ordinary-sized bronchus.

6. *Amphoric.* A still more hollow sound, and very metallic in quality, it resembles that produced by blowing into a large empty glass bottle. For its production, it is necessary to have an extensive, empty cavity, with firm and smooth walls, into which air enters freely.

Causes. *a.* *Pneumothorax*, air entering the pleura through an opening in the lung. *b.* Very extensive phthisical excavation in the lung, having one or more bronchi communicating with it.

All these morbid sounds may be heard in different parts of the same chest, or may be observed in succession over the same region, as the physical conditions change, there being no marked boundary-line between them, but a gradual transition from one to another. For instance, in phthisis, the breathing, which is at first *bronchial*, may become *blowing*, especially in certain parts, and then pass into *tubular*, *cavernous*, or even *amphoric*, as cavities form and increase in size. With regard to the hollow sounds, though usually present during inspiration and expiration, they may only be heard during the former act. A deep breath usually makes them much louder, and frequently a sharp cough enables them to be heard where they did not exist before, owing to the displacement of some obstructing secretion, or the emptying of a cavity. They may appear to be superficial and strong, or more or less deep and feeble. Care must be taken against mistaking a *conducted pharyngeal sound* for cavernous respiration.

7. In rare instances *peculiar respiratory sounds* are met with. In connection with some cavities they may have a *sucking* or *hissing* character. Sometimes the air appears to be drawn away during inspiration, and puffed back during expiration; this gives rise to the *souffle* or *veiled puff*.

ADVENTITIOUS SOUNDS, PRODUCED IN THE LUNGS OR BRONCHI. "RALES," OR "RHONCHI."

So many different classifications of these adventitious sounds have been invented, and the same term has been so often used to express totally different things, or *vice versâ*, that a great deal of confusion frequently exists with regard to them. Before proceeding to their consideration, it is necessary to mention that they may be simulated by sounds resulting from contraction of the muscles of the chest-wall; subcutaneous oedema; hairs on the surface of the thorax; fluid in the mediastinal cellular tissue;

or the opening-up of healthy lung-tissue, when a deep inspiration is made. The mere recollection of these will prevent them from being mistaken for "râles."

Physical conditions which may produce "râles." It may be well to give a general summary of what these adventitious sounds may be due to. They are generally produced by the *passage of air during the act of breathing:* (i.) Through bronchial tubes, narrowed by thickening of the mucous membrane; by various deposits upon it, such as thick secretion, or exudation; or by spasm of the muscular fibres. (ii.) Through *fluids* of different degrees of consistence, either contained in normal or enlarged air-tubes or vesicles, or in cavities in the lungs. (iii.) Through substances, which have been solid, but have commenced to soften. (iv.) Into air-vesicles, either of normal size or enlarged, the walls of which are collapsed or stuck together, thus causing them to open up. In rare instances, *the action of the heart* causes "rhonchal sounds," when there is much fluid in contiguous tubes or cavities.

What to observe in connection with "râles." By the aid of these sounds, we endeavor to gain exact information as to certain physical conditions in the lungs, and to determine the morbid states which they indicate. In order to do this satisfactorily, the following points must be noticed with regard to them: 1. *Their characters,* viz.: whether *dry or liquid; size; quality,* whether crackling, bubbling, gurgling, whistling, &c.; *pitch;* whether at all *hollow* or *metallic,* and the degree to which this character is present. 2. *Whether they are heard both during inspiration or expiration, or only during one of these acts.* 3. *Their situation, and the extent over which they are perceived.* 4. *Their amount.* 5. *Whether they are constant, or only heard at intervals, and if they are affected by a full inspiration or cough.*

CLASSIFICATION OF "RALES" AND THEIR SPECIAL CAUSES.

I. VIBRATORY OR DRY MUSICAL RALES.—1. *Sonorous.* This is a loud, deep-toned, low-pitched sound, varying much in its exact *quality,* which may be snoring, growling, humming, cooing, &c.; it appears superficial, is often extensively heard, and generally accompanies both inspiration and expiration, but may be limited to either, especially the latter. 2. *Sibilant.* Of much higher pitch, it is often whistling, hissing, or musical. It is not so extensively heard as the *sonorous râles,* and is as a rule present during inspiration and expiration. Both these "râles" are liable to much irregularity, disappearing from time to time, especially after a cough, and they often occur together. *Mode of production.* These sounds are produced by air traversing tubes, narrowed in some of the ways already mentioned. They will vary according to the size of the tube affected, and the immediate cause of the narrowing. *Causes.*

a. Bronchitis, especially *chronic*, but also *acute*, in its early stage, and the *plastic* variety. *b. Spasmodic contraction of the bronchial tubes* in asthma, &c.

II. CREPITANT RHONCHI.—1. *True crepitant rhonchus.* This is a sound only met with in the *early stage of acute pneumonia.* It is, therefore, observed usually towards the base of the lung, but may be in any part where the inflammatory process is commencing. *Characters.* It consists of a great number of extremely minute, sharp, crepitant, or crackling sounds; equal in size; perfectly dry; heard in short puffs *during inspiration alone* in most cases, and often only towards its termination; increased in amount by a deep breath. It has been aptly compared to the sound produced by rubbing a lock of hair firmly between the finger and thumb close to the ear; or to the burning of salt in the fire. *Mode of production.* The theories as to the production of *crepitant rhonchus* are, that it is due to the opening up of air-vesicles stuck together; to air passing through thick secretion; or to minute lacerations of lung-tissue. 2. *Redux crepitant rhonchus.* Heard in the advanced stage of acute pneumonia, when resolution is taking place, it differs from the former, in the crepiti being much less abundant, larger, and of unequal size, less dry, and perceived during both inspiration and expiration. It gives the impression of air passing through thick fluid, which is its *pathological cause.* A sound much resembling this is sometimes noticed in phthisis. 3. A *large, dry crepitant râle* is said to be observed in some cases of emphysema, not abundant, and resembling the sound produced by inflating a bladder. It is supposed to be due to the opening up of enlarged vesicles. 4. *Compression or collapse rhonchus.* When the lung is compressed or collapsed from any cause, a râle, consisting of a number of small, dry crepitations, may be slowly evolved at the close of, or immediately after, a deep inspiration.

III. CRACKLING OR CLICKING RHONCHI.—1. *Dry crackling* or *dry crepitation.* It consists of some three or four crackles or "clicks," sharp, abrupt, and dry, only heard usually during inspiration. *Mode of production.* This rhonchus is only present in a certain stage of phthisis, viz.: when the consolidating material begins to soften, and it gives the impression of air traversing such a substance. The apex of the lung is its ordinary seat. 2. *Moist*, also termed *humid crackling*, and *humid* or *moist crepitation.* Crackling in character, it is more abundant than the "dry rhonchus," though the crackles are not large or numerous, but they are more moist, as if air were passing through a less consistent substance, and occur both during inspiration and expiration, being most marked usually in the former. *Mode of production.* This râle follows the dry generally, and indicates a more advanced condition of softening in phthisis.

IV. MUCOUS RALES, SUBMUCOUS AND SUBCREPITANT.—These constitute a very common class of rhonchal sounds, and their characters are easily apprehended. They generally consist of a number of distinct "bubbles," but may be "rattling," or somewhat "gurgling." The bubbles vary in size considerably, as well as in number and pitch. If they are large, or of medium size, the rhonchus is called *mucous;* if small, *submucous;* and, if very minute, *subcrepitant*, because it then somewhat resembles a crepitant sound. They are heard during inspiration and expiration, generally more with the former, and may be so abundant as completely to hide the breath-sounds. A cough, with expectoration, often influences them greatly, both as to amount and site, causing them sometimes to disappear completely. At the bases of the lungs these rhonchi are most common and most marked, but they may be universal over the chest. In children, and when they originate in the larger tubes, they are apt to have a somewhat metallic character. *Mode of Production.* The transmission of air through fluid contained in the air-tubes produces these rhonchi. The varieties that are met with depend upon the nature and quantity of the fluid, and the size of the tubes in which it exists. By observing all the characters of the râles, an accurate idea may be obtained on these points, which is often of much importance. *Causes.* (i.) *Bronchitis.* (ii.) Œdema of the lungs. (iii.) Hemorrhage into the bronchial tubes. (iv.) Rarely fluid from outside the lung emptying itself through the bronchi, such as pleuritic effusion.

V. HOLLOW RHONCHI. The essential character of these abnormal sounds is that they are all more or less hollow, and convey the impression of originating in a cavity. As a rule they are somewhat "bubbling," but may be distinctly "crackling" or "gurgling." They vary much in their size and amount, and are very liable to change. Their degree of hollowness and pitch depends upon the size and other conditions of the cavity in which they are produced, and to such varieties the terms "cavernulous," "cavernous," "amphoric," "ringing," "metallic," &c., are applied. They are heard generally with inspiration and expiration, but may be limited to either. A cough often makes them disappear or become more evident. *Mode of Production.* For the production of these sounds *a cavity must exist, containing fluid, into which air enters;* and, as already stated, the conditions of the cavity will influence their degree of hollowness, while the amount and consistence of the fluid will affect the actual quality and abundance of the rhonchus. Hence they give most useful information with regard to the existence of cavities and their exact conditions. Ordinary mucous râles may have a hollow character occasionally, if produced near a large cavity. The heart's action sometimes causes cavernous râles, by agitating the fluid in a contiguous cavity.

ADVENTITIOUS SOUNDS ORIGINATING IN THE PLEURA—FRICTION OR ATTRITION SOUNDS.

By the rubbing together of the adjacent surfaces of the pleura, when this is the seat of certain morbid changes, important signs are elicited during the act of breathing, usually termed, as a class, *friction-sounds.* In examining for these, it is essential to investigate *every part of the chest*, but especially its lower portion, laterally and behind, as they may be present over but a very small area. It is also necessary *to make the patient breathe deeply*, otherwise the requisite rubbing together of the surfaces may not be produced.

1. *Characters.* As a rule friction-sounds are more or less *rubbing*, varying from a slight *graze* to a loud *grating* sound. They may be *creaking, crackling, clicking, rumbling*, &c. In not a few cases they much resemble "crackling," or even small mucous râles, but are distinguished from these by not disappearing after a cough. *Superficialness* is a prominent character of all these sounds. 2. *Site and Extent.* The lower part of the chest is generally the seat of "friction-sounds," especially about the angle of the scapula, and towards the infra-axillary region. The extent is generally limited, sometimes not covering an area of more than an inch, but friction may be heard all over one, or even both sides. 3. *Intensity.* This varies from a scarcely perceptible rub to a sound almost audible at a distance from the chest. Generally it is moderately loud. 4. *Rhythm.* "Friction" is usually most perceptible during inspiration, but often accompanies expiration also. It may only be produced at the end of a deep inspiration. It is frequently irregular and jerky. 5. *Causes.* The *pathological conditions* in connection with the pleura which produce friction-sounds are: *a.* Increased vascularity, with prominence of the vessels, this only giving rise to a slight grazing. *b. Deposit of exudation and proliferation of cellular tissue associated with pleurisy*, the characters of the sound depending upon the thickness and density of the material formed, and the amount of fluid mixed with it. *c.* Tubercular and cancerous deposits. *d.* It is said that large projecting air-vesicles in emphysema may cause a slight rubbing sound.

VOCAL RESONANCE, INCLUDING THAT OF THE CRY.

The chief points to notice with regard to the *vocal resonance* are: 1, its intensity and clearness; 2, its quality and pitch; and 3, the area over which it can be heard. The following are the deviations from the normal state which are met with:

1. THE RESONANCE MAY BE WEAKENED, MORE OR LESS, UNTIL IT IS COMPLETELY ABSENT OVER A VARIABLE EXTENT OF SURFACE.—*Causes.* (i.) *Air or fluid in the pleura*, separating the lung from the chest-wall.

(ii.) *Very extensive or dense consolidations*, such as cancer, some cases of phthisis. (iii.) *Emphysema* in many cases, but not all. (iv.) *Intra-thoracic tumors*, or enlarged abdominal organs encroaching upon the chest. (v.) Obstruction of the bronchi.

2. It may be Increased in Intensity or Clearness.—And this may or may not be associated with *alterations in quality and pitch.* Four varieties are recognized of this abnormal condition.

(i.) *Bronchophony.*—This term means merely an *increase in the clearness of the vocal resonance*, which is generally *intensified* as well. It is noticed in health in the interscapular regions, especially at the upper part, and frequently under the inner end of the clavicles. *Causes. a. Any lung consolidation, provided it is not excessive, e. g.*, phthisis or pneumonia; in the latter the bronchophony has peculiar characters, being *metallic* and *sniffling. b. Small cavities in the lung with thickening and consolidation around. c. Condensation of the lung by pressure. d.* Occasionally *a solid mass, not too large, intervening between a bronchus and the chest-wall.*

(ii.) *Pectoriloquy.*—The voice seems to be conducted directly to the ear, along the stethoscope, and the words may often be distinctly understood. It is not uncommonly very intense, and causes a most unpleasant sensation to the listener. *Causes. a. Certain cavities* in the lungs in the great majority of cases. The conditions required are, that the cavity is of good size, but not too large; tolerably smooth, and not containing much fluid; with firm, but not too thick walls; being near or adherent to the chest-walls; and having one or more bronchi communicating with it, so that air may enter. *b.* Very rarely a solid mass between a large bronchus and the chest-wall. *c.* Occasionally pneumothorax.

A variety of pectoriloquy is described under the term *whispering pectoriloquy*, in which a whisper is clearly heard, and often the separate words distinguished. This, however, is not an altered character of the voice, but merely a modified expiratory sound. It is only present where *large and superficial cavities exist*, and is best heard in *pneumothorax*, but is not unfrequently noticed in connection with *phthisical cavities.*

(iii.) *Œgophony.*—The vocal resonance has a peculiar *bleating or nasal character* in some cases of pleuritic effusion, to which the above term has been applied. As a rule, it is heard best about the angle of the scapula, but may vary with a change in the position of the patient. Some authorities think it is due to the presence of a thin layer of fluid between the lung and the chest-wall; others, that it is caused by flattening of some of the bronchial tubes, from superficial collapse of the lung in consequence of pressure.

(iv.) *Amphoric Resonance.*—In some large cavities, with firm walls, the voice has a characteristic hollow, metallic character, corresponding to *amphoric breathing.* It is only very rarely met with, associated with large phthisical cavities, or pneumothorax.

3. The AREA over which *vocal resonance* can be heard, will be influenced by the same conditions as those which affect that of the *vocal fremitus*.

TUSSIVE RESONANCE.

The *cough* may be intensified in connection with consolidations and cavities, and may assume peculiar characters, hence named "bronchial," "cavernous," "metallic," "amphoric," &c., but these alterations do not add much to the knowledge gained by observing the vocal resonance. The uses of cough in the investigation of disease, which can be best turned to practical account, are these: 1. During the act various "rhonchi" may be produced, which are not heard during the mere act of breathing, especially in connection with cavities. 2. Various fluid substances, which have accumulated in bronchial tubes, or in connection with cavities, may be dispersed and expelled, râles being thus done away with, and the breath-sound made louder, so that its characters may be observed. Thus cough may be the means of enabling us to distinguish between friction-sounds and those produced within the lung; and, in connection with cavities, cavernous, or some other breath-sound may be heard after a cough, where previously the respiration has been quite inaudible.

PECULIAR SOUNDS HEARD IN CONNECTION WITH LARGE CAVITIES.

1. *Metallic Tinkling.* Resembling the sound produced by striking a glass vessel with a pin, this is a single, clear, high-pitched, ringing sound, heard in connection with large air-containing spaces, in which there is a little fluid. It is supposed to be produced by the bursting of a bubble, or dropping of fluid from the top of the cavity, and may be originated by breathing, speaking, coughing, or, rarely, by the action of the heart. *Phthisis* and *hydro-pneumothorax* are the diseases in which it occurs.

2. *Amphoric Echo.* An echo of this character may attend the respiratory sounds, voice, cough, rhonchi, the heart-sounds, or even the act of swallowing. There must be a large cavity, smooth, and containing air—such as is met with in *pneumothorax*, and occasionally in *phthisis*.

3. *Bell-sound.* In some cases of pneumothorax, when a coin is placed on the chest, and struck with another, a clear sound, like striking a bell, may be heard on listening over another part of the chest.

VI. SUCCUSSION.

This is a mode of examination very seldom required, and merely shows the presence of air and fluid in a large cavity. The signs produced by shaking a patient are: 1. A splashing sensation felt by the hand. 2.

A splashing sound. They are occasionally present in *hydro-pneumothorax*, and extremely rarely when large phthisical cavities exist.

Examination of the Heart.

I. Changes in the Form and Size of the Cardiac Region.

1. *Bulging.* This may extend from the second down to the seventh cartilage, and involve the sternum partly. The intercostal spaces are either normal or prominent. Measurement shows that there is a greater distance from the nipple to mid-sternum on the left than the right side. In young persons bulging is most marked as a rule. *Causes.* (i.) *Enlargement of the heart, especially hypertrophy,* alone or with dilatation. (ii.) *Pericardial effusion.*

2. *Depression.* There may be a general falling-in, or the spaces are chiefly affected. *Cause. Pericardial agglutination,* with adhesion to the chest-wall.

II. Cardiac Impulse.

In examining the impulse by *inspection* and *palpation* we have to notice: 1. Its *exact position,* and whether this varies with different beats of the heart. 2. *Its area,* as seen and felt, and *if it is well-defined or not.* 3. *Its force.* 4. *The characters* it presents to the touch. 5. *Its rhythm.* 6 *The effects of change of posture upon it.*

In health the impulse is usually felt in the fifth left interspace, about 1½ inch below, and ¾ inch inside the nipple, over an area of about an inch. Single and systolic in time, it is somewhat heaving, and gliding down and to the left, gradual and not abrupt in its development.

Impulse in Disease.—1. *Position.* The impulse may be displaced by *conditions external to the heart;* by morbid changes in the pericardium; by alterations in the size of the heart itself; or by a combination of these. (i.) *Elevation.* The apex-beat is often raised to the fourth space or higher. *Causes. a. Pushing up of the heart* by some abdominal enlargement, such as ascites or enlarged liver. *b. Upward traction,* owing to diminution in the bulk of the lung from contraction of a cavity in the left apex, or to a less extent in the right, with the formation of adhesions. *c. Pericardial effusion* and *subsequent adhesion. d. Diminution in the size of the heart* from atrophy or great loss of blood. (ii.) *Depression. Causes. a. Cardiac enlargements,* especially *hypertrophy,* either general or affecting the left side, when the impulse may be down to the seventh rib or space. *b.* An aneurism or other tumor above the heart, pushing it down. *c.* Pericardial effusion in some cases. *d.* Weakness of the great vessels, owing to some acute or long-continued illness, allowing the heart to fall down. (iii.) *Lateral displacement either to the right or left,* which is often combined with elevation or lowering. *Causes.* *a.* The heart may be pushed aside by *a collection of fluid or gas in a pleural cavity*, especially the left: an enlarged lung, from emphysema, hypertrophy, or cancer; or an aneurism or other tumor. *b. Cardiac enlargements.* According to the nature of the enlargement, and the part of the heart affected, the impulse will be more to one side or the other. As a rule it may be said that *hypertrophy* tends to carry it to the left, *dilatation* to the right. *c. Pericardial effusion*, which always carries the apex-beat to the left. (iv.) Occasionally the impulse *alters its position* with each beat of the heart, when *great dilatation exists*.

2. *Area and degree of definition.* (i.) The area is often *increased* to a variable extent, being either well defined or the reverse. *Causes.* *a.* *Cardiac enlargements*, especially if associated with *pericardial agglutination*. *b. Excited action of the heart.* *c. The heart may be too much in contact with the chest-walls*, either from retraction of the left lung; adhesion between the pericardium and costal pleura; pressure behind by an enlarged liver or spleen, or a tumor; or falling-in of the chest-walls. *d. Pericardial effusion*, in which the impulse appears to be very extensive and ill-defined. (ii.) *Diminished area* is observed in *most* of the conditions which *weaken the impulse*, but it is not of much practical importance.

3. *Force.* *a. Increased.* *Causes.* (i.) *Hypertrophy of the heart.* (ii.) Too close contact with the chest-walls. (iii.) Excited action. *b. Diminished, sometimes to complete extinction.* *Causes.* (i.) Functional weak action of the heart from any cause. (ii.) Certain cardiac diseases, viz., *dilatation*, *fatty degeneration* or *infiltration*, atrophy. (iii.) *Fluid or air in the pericardial sac.* (iv.) Distension of the lungs, especially the left, from emphysema or hypertrophy, which then come between the heart and the chest-walls.

4. *Characters.* The impulse often presents unusual characters. *a. Undulatory or wave-like.* This may be only visible, or felt as well. *Causes.* (i.) *Pericardial effusion.* (ii.) *Dilatation of the heart*, with thin, weak, and degenerate walls. (iii.) Occasionally uncovering of the heart, with adhesions to the chest-wall. *b. Heaving or pushing.* It is in observing this character that the stethoscope is useful, through which the movement becomes very obvious, both to the auscultator and to bystanders. It is distinctive of *cardiac hypertrophy*. *c.* In *dilatation* the impulse is often *quick*, *sharp*, and *slapping*. *d.* When the heart is very feeble the action may be *jerking* or *fluttering*. *e.* If pericardial agglutination exists along with hypertrophy or dilatation and valvular disease, the impulse often acquires very peculiar characters, differing in different cases, and there may be even a *recession* rather than an impulse.

5. *Rhythm.* *a. Irregularity* is often observed, both as regards force and time, or the beat may be intermittent. *Causes.* (i.) Functional disturbance of the heart's action. (ii.) Cardiac diseases, viz , great dilata-

tion, fatty disease, and some cases of mitral or aortic regurgitation. with enlargement of the left ventricle. (iii.) Malformation of the heart. (iv.) Occasionally pericardial effusions, and not unfrequently pericardial adhesions. *b.* In *pericardial effusion* the impulse sometimes seems *to lag behind the ventricular systole*, as if it took some time to be conveyed to the surface. *c.* The impulse may be *double* or *treble* (systolic), or a *diastolic* impulse may likewise be present. This occurs in some instances of dilatation and hypertrophy with adhesions.

6. *Effects of Change of Posture.*—*Increased mobility* of the apex-beat has been considered a sign of *pericardial effusion*, but it is not of much importance. The fact that it *does not alter in different postures* is sometimes of much aid in determining the existence of adhesions—pericardial and pleuritic.

It is necessary to allude briefly to the impulse often seen towards the base of the heart, and in the epigastrium. *Basic impulse* is observed in many cases, where a *cavity in the apex of the left lung has contracted*, drawing up the heart, and bringing it close to the chest-walls, adhesions probably forming. It may be due to excessive *hypertrophy* about the base, or *aneurism of the heart*. *Epigastric impulse* is generally *cardiac*, but is sometimes the result of *aortic pulsation*, or, it is said, *regurgitation into the inferior vena cava*. The *cardiac impulse* is either due to displacement of the heart; enlargement of the right ventricle; or it may be the natural consequence of a short thorax.

III. PECULIAR SENSATIONS FELT OVER THE CARDIAC REGION.

In connection with the action of the heart, certain sensations are sometimes produced, which require a brief separate consideration.

1. *Thrill or Purring Tremor.*—These terms sufficiently indicate the character of the peculiar vibratory sensation conveyed to the fingers, which is indicative of certain conditions of the orifices and valves. In order to determine the origin of a *thrill*, it is necessary to observe its *situation* and *synchronism*. It may be requisite to excite the heart by brisk movement before it can be distinguished. The different *thrills* met with are as follows: (i.) *At the left apex; a. systolic*, comparatively frequent, and indicating *mitral regurgitation*, especially if associated with hypertrophy. *b. Præsystolic*, or *post-diastolic*, associated with *mitral obstruction*. (ii.) At the *right base*, in the *second interspace*, near the sternum. *a. Systolic; b. diastolic;* due respectively to *aortic obstruction* and *regurgitation*. The former may also be felt above the sternum. (iii.) Very rarely *systolic* in second *left* space, or opposite the third cartilage, indicating *pulmonary obstruction*. (iv.) *Præsystolic* in fourth left space, or opposite the fourth cartilage. This is a mere curiosity, but has been said to exist with *tricuspid obstruction*.

2. *Pericardial friction-fremitus* is very exceptionally observed in *pericarditis*. Differing in its characters entirely from *thrill*, it seems quite superficial and rubbing, is movable and irregular as regards its site and rhythm, though usually felt chiefly during the systole, and seldom lasts for any length of time. It may be simulated by pleuritic fremitus, produced by the action of the heart.

IV. CARDIAC PERCUSSION.

A. CARDIAC DULNESS.—This is described as being *superficial* or *deep*. The former corresponds to the part of the heart uncovered by lung, is triangular in shape, bounded to the right by a line along the middle of the sternum from the fourth cartilage, and to the left by a line extending obliquely from the same point to the apex. The *deep dulness* extends to the limits of the entire heart, but it is exceedingly difficult to make it out, and this cannot be done without much practice.

CARDIAC DULNESS IN DISEASE.—It is necessary to notice—1. *Its position*. 2. *Extent*. 3. *Shape*. 4. Degree and quality. 5. Whether it is influenced by change in posture.

1. *Position*. This may be entirely abnormal, as, for instance, when the heart is displaced to the right by pleuritic effusion.

2. *Extent*. *a*. It may *be increased* more or less, this being usually associated with some change in shape. *Causes*. (i.) Abnormal contact of the heart with the chest-walls, especially when due to retraction of the lung. (ii.) *Enlargements of the heart*, the extent and form depending upon the part of the heart involved, and whether there is hypertrophy, dilatation, or both combined. (iii.) *Accumulation of blood in the cavities or walls of the heart*, especially as the result of some pulmonary obstruction. (iv.) *Any liquid or solid collection within the pericardium*, but especially effusion from inflammation, and excess of fat. (v.) Increase in cardiac dulness may be simulated by *conditions external to the heart*, *e. g.*, consolidation of the margin of the lung, a tumor, or aneurism of the aorta.

b. *Diminution in cardiac dulness* is not reliable in determining the state of the heart, but is most useful as *indicating distension of the lungs*, especially the left. *Causes*. (i.) *Atrophy* of the heart. (ii.) Great loss of blood, and consequent emptiness of the cavities. (iii.) Accumulation of air in the pericardium. (iv.) Hypertrophy or emphysema of the lungs.

3. *Shape*. The *form of the dulness* is often useful in making out the cause of any increase. In *pericardial effusion* it tends to be *triangular*, with the base down, and the apex upwards. In *hypertrophy* it becomes elongated vertically; in *dilatation* lateral enlargement takes place, especially towards the right, and the shape is square or circular. The form, however, will be modified, according to the part of the heart involved, and the degree in which the two conditions are combined.

4. *Quality and Degree. The degree of dulness* has been said to afford a distinction between *pericardial effusion* and *cardiac enlargements*, it *being more marked* in the former. Very little reliance can be placed, however, on this difference. If the pericardium or heart is calcified, the percussion-note may become somewhat *osteal.*

5. With *change of posture* the dulness due to *pericardial effusion* may be made to alter in *extent* and *form.*

B. Resistance.—This is stated to be greater in *pericardial effusion* than in *hypertrophy.*

V. Auscultation of the Heart.

A. Sounds of the Heart.

It is essential to have a clear comprehension of the mode of action of the heart, and of the sounds thereby produced, before auscultation can be of any value in investigating for disease. With regard to the sounds, it is requisite to know the characters of each—systolic and diastolic—and how these differ, as examination is made over different parts of the thorax, as well as their modes of production.

During each action of the heart, when listening at the apex, there may be noticed in succession: 1. A *systolic sound*, synchronous with the contraction of the ventricles. 2. A *short silence.* 3. A *diastolic sound* at the moment when the ventricles cease to contract, and the aortic and pulmonary valves close. 4. A *longer silence*, which is again followed by the *systolic sound*, &c. As regards time, they bear about the following relation to each other, dividing an entire cardiac action into tenths:

Syst. sound.	*1st interval.*	*Diast. sound.*	*2d interval.*
$\frac{4}{10}$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$

At the left apex, *i.e.*, just within and below the nipple, the *systolic sound* is prolonged and well defined, much accentuated, seems muffled and rather deep, and of rather low pitch. The *diastolic* is much shorter, sharper, and more abrupt, clearer, more superficial, and higher pitched. *At the right apex*, *i. e.*, over the ensiform cartilage, both sounds are clearer and higher pitched than at the left, and the *systolic* is less accentuated, shorter, and sharper. *Comparing the sounds at the base and apex*, it will be found that at the base the *diastolic sound* becomes the more marked. It is loud and distinct, much accentuated, clear, and often ringing, while the *systolic* is dull and indefinite, shorter, and without any accent. *At the right base*, *i. e*, opposite the second space or third cartilage, close to the sternum, the sounds are usually louder than at the corresponding point on the left side, especially the *diastolic.* Finally, it must be noticed that the sounds are generally better heard under the *left clavicle*, and over the left side posteriorly, than over the corresponding regions on the right side. *Modes of production.* It is now generally recognized that the *systolic sound* is due chiefly to the *tension of the mitral and tricuspid valves,* and the *muscular contraction of the ventricles,* while the *diastolic* results from *tension of the aortic and pulmonary valves.*

In auscultating the heart, in order to detect abnormal conditions, it may be necessary to make the patient stop breathing for a moment, and it is often advisable to excite the heart by a little brisk movement. In comparing the sounds at the base and apex, some authorities recommend the use of a double stethoscope, so that they may be heard at the same time, but the ordinary instrument answers perfectly well.

HEART-SOUNDS IN DISEASE.—The information obtained by examination of the heart-sounds may be summed up as follows: 1. With regard to the state of the *heart itself,* as to *size,* the *condition of its walls,* its *functional activity,* and in some cases *the state of its orifices and valves.* 2. The *existence of abnormal accumulations in the pericardium,* or of *adhesions of its surfaces.* 3. The presence of certain affections of the surrounding organs and structures, especially the lungs. 4. The quantity and quality of the blood.

EXAMINATION OF THE SOUNDS AT THE LEFT APEX.

1. *Intensity and apparent depth.* *a. Increased.* *Causes.* (i.) Excited action of the heart from any cause. (ii.) Approximation of the heart to the chest-walls, when the sounds also appear to be superficial. (iii.) *Combined hypertrophy and dilatation,* particularly if the valves are somewhat hypertrophied at the same time. (iv.) Deficient quantity, or a watery condition of the blood. *b. Diminished.* *Causes.* (i.) Feeble action of the heart. (ii.) Certain organic cardiac affections, viz.: *atrophy, simple or concentric hypertrophy, dilatation with thinning of the walls, changes in the muscular walls,* especially *fatty disease,* but also softening connected with febrile diseases, and fibroid or cancerous infiltration. (iii.) Collection of *fluid,* air, or much solid material in the pericardial sac. (iv.) Distension of the left lung by emphysema or hypertrophy. In the last two conditions the sounds appear to be *deep,* in consequence of imperfectly conducting materials coming between the heart and the parietes of the chest.

2. The *pitch, quality,* and *degree of clearness* of the *systolic sound,* may give important information as to the condition of the valves of the heart and of its walls, and also as to the *quality of the blood.* If *much hypertrophy* exists, *without dilatation,* the sound is toneless, dull, obscure, and of very low pitch. In *dilated hypertrophy,* with some thickening of the valves, it becomes clanging or musical. When mere *dilatation* is present, it is often high-pitched, abrupt, and clicking, or slapping. *Anæmia* frequently causes it to be sharp, clear, and high-pitched.

3. It is important to notice the *length of the systolic sound*, and to *compare the relative lengths of the sounds and intervals*. For instance, in *dilated hypertrophy*, the *systolic sound* is very prolonged, there may be hardly any *diastolic* sound, and the intervals are shortened. In *mere dilatation*, the *diastolic* sound often becomes the longer one, so as to simulate the *systolic*, which is much shortened.

Comparison of the Sounds in different parts of the Chest.—It is often of advantage to compare the sounds as heard over different parts of the thorax, but especially at the *apex and base of the heart*, and at the right and left apex or base. As illustrations of the knowledge thus to be gained, the following are important: 1. If the sounds, *being weak at the apex, are louder at the base*, this serves to distinguish *pericardial effusion* from *dilatation* or *fatty heart*. 2. Greater intensity at the *right apex* than *the left*, either shows displacement of the heart, or that it is covered by some imperfect conducting material, especially an emphysematous lung. 3. Louder sounds at the *left base* than *the right*, especially the *diastolic*, indicate that there is some interference with the passage of blood through the *mitral orifice*, so that the pulmonary circulation is overloaded, and the pulmonary artery distended. 4. Any condition, either in the heart itself, or external to it, which alters the position of the heart, will correspondingly modify the sounds. For example, in left pleuritic effusion, they are transferred to the right side of the chest. 5. The *extent and direction of conduction of the sounds*, may be useful in determining disease in other organs. Thus, in *consolidation at the apex of the right lung*, they are very often louder under the right clavicle than the left. In *right basic pneumonia* they are often very marked over the affected part. *Cavities in the lungs* may intensify the sounds considerably, or sometimes impart to them unusual character, such as hollowness or metallic quality.

Reduplication.—By this is meant a doubling of either sound. It is frequently observed, even in health, and does not, as a rule, indicate disease; its cause being usually a want of synchronism in the action of the two sides of the heart. It may be present with either or both sounds, and observed at the apex or base. Without care, it might be mistaken for a murmur. Occasionally a sound is *trebled*.

B. Endocardial Murmurs.

An *endocardial murmur* is usually associated with one of the cardiac orifices, being either one of the ordinary sounds altered in its characters, or a new sound altogether. For determining its *origin and cause*, it is necessary to observe: 1. *The seat of its greatest intensity*. 2. *The directions in which it is conducted*. (These two characters indicate *the orifice* which is affected.) 3. Its *time*, whether *systolic*, *diastolic*, *præsystolic*, or *post-diastolic.* (This gives information as to the presence of *obstruction* or *regurgitation.*) 4. These being the essential characters to notice, it is always advisable, however, to attend to other particulars, especially the *duration, loudness, quality,* and *pitch* of a murmur, and its influence upon the ordinary sounds. Thus a tolerably accurate conclusion may be arrived at with regard to the actual conditions of the valves and orifices, as to the degree of obstruction or regurgitation, quantity and quality of deposit, &c.; the state of the heart's walls, and the manner in which it is acting; and the quality of the blood.

GENERAL CAUSES OF MURMURS.—1. In the large majority of cases, a murmur depends upon *some morbid condition in connection with one of the cardiac orifices,* which either causes *obstruction* to the onward passage of the blood, or permits *regurgitation,* owing to imperfect closure of the valves. (i.) *Obstruction* may arise from: *a. Constriction* at or about an orifice, its margins being also generally thickened. *b.* Some *direct impediment,* as from greatly enlarged and nodulated, or adherent valves, which cannot fall back. *c.* External pressure by a tumor, fibrous thickening, &c., or by *the stethoscope. d.* Twisting of the orifice, owing to displacement of the heart, with a wrong direction of the current of blood. (ii.) *Regurgitation* may be due to—*a. Mere enlargement of an orifice,* the valves not widening in proportion. *b. Organic changes in the valves,* which prevent them from performing their functions properly, such as actual destruction or rupture, perforation, great contraction, thickening, rigidity, adhesions to the walls of the heart. *c. Organic changes in the appendages of the valves,* viz., the chordæ tendineæ, and musculi papillares, which interfere with their closure. *d. Mere irregular action or altered position of the musculi papillares,* which prevents the valves from falling into their places at the proper time or in the proper manner. *e.* Degeneration at the root of one of the great arteries, interfering with the adaptation of its valves. Most of the causes further enumerated are very unusual. 2. Mere roughness of the endocardium, especially from inflammation, and particularly if in the vicinity of an orifice. 3. Fibrinous coagula among the columnæ carneæ, or upon the surface of the valves, forming vegetations. 4. Sacculated aneurism of the heart. 5. Abnormal communications between the cavities of the heart, or with the great vessels. 6. Dilatation of the aorta at its commencement, the orifice being unaltered. 7. Violent palpitation. 8. An unhealthy condition of the blood. Murmurs have been appropriately divided into *organic* and *inorganic,* according as they are associated or not with positive organic mischief. The latter will be presently alluded to separately.

CHARACTERS OF MURMURS AT EACH ORIFICE.—*Two murmurs* may exist in connection with each of the four chief orifices of the heart, one indicating *obstruction,* the other *regurgitation;* but practically it is found that only *mitral* and *aortic* murmurs are usually met with, those associated with the *tricuspid* and *pulmonary* orifices being very exceptional.

I. Mitral Murmurs.—These are loudest just above the left apex, being conducted round in the direction of the left axilla, and, to some extent, upwards towards the base. 1. *Regurgitant. Systolic* in time, it is generally of medium or low pitch, but varies much in its other characters; it may be so loud as to be heard extensively over the chest, but is not often distinct at the base of the heart, and frequently becomes abruptly fainter on passing the stethoscope in this direction. It is frequently perceptible behind, in the left vertebral groove, or even the right, especially opposite the sixth to the ninth dorsal vertebræ. 2. *Obstructive or constrictive.* Usually this murmur is *post-diastolic* or *præsystolic*, being entirely a *new sound*, and having no connection with the *diastolic* sound. In some cases, however, it seems almost to begin simultaneously with this, and to continue through the entire interval. Its explanation is as follows: As soon as the ventricle ceases to contract the mitral valves fall back and the orifice becomes patent. The blood which has collected in the auricle quietly passes through for awhile, but finally the auricle, being distended, suddenly contracts, and drives on the blood with some force, this being immediately followed by the ventricular systole. It is at the time of this contraction that the murmur usually occurs, and hence it is sometimes called "auriculo-systolic." If, however, there is great constriction, with much thickening and roughness about the opening, it may be heard during the whole of the period that the blood is passing through. Hence the length of this murmur varies, but it is usually rather short. Its *intensity* is rarely very great, and therefore the extent of its conduction is much less than that of regurgitant murmur, while it is only exceptionally heard in the back. The pitch is low, and quality usually rather harsh. Recently Dr. Barclay has argued that this murmur really indicates regurgitation and not obstruction.

II. Aortic Murmurs. 1. *Obstructive.* Most marked *at the base* of the heart, generally over the sternum, and in the contiguous portion of *the second right space* it is conducted upwards and to the right, as well as to some extent down along the sternum and towards the left apex, but is not often heard there. Behind it is audible in the left vertebral groove, usually from about the second or third to the sixth or seventh dorsal vertebra, but sometimes is heard all along the dorsal region, and even on the right side. I have met with several instances in which the murmur was so loud as to be heard over the chest and back extensively and for a considerable distance along the arteries. It is generally prolonged and of rather high pitch, not unfrequently musical.

2. *Regurgitant.* This murmur is usually loudest over the sternum, opposite the third space or fourth cartilage, being conducted chiefly downwards along the sternum, so as to be very distinct at its lower end, where

it generally abruptly ceases. Towards the apex and the right infraclavicular region it is not nearly so well conducted as the *obstructive murmur*, and it is only rarely heard in the back. Its rhythm is precisely *diastolic*, it being, in fact, an *altered second sound*, but it is always prolonged more or less into the interval, and may fill it completely. Indeed its duration is often so great as to lead to its being mistaken by the inexperienced for a systolic murmur, even when both exist together. Commonly it is of *blowing* quality, not harsh, and of medium or high pitch, but its characters are variable.

III. Tricuspid Murmurs.—These are said to be heard at the *right apex*, at the junction of the xiphoid cartilage and sternum, and to be conducted a little upwards and to either side. 1. *Regurgitant.* Regurgitation frequently occurs at the tricuspid orifice, but as it is due to mere enlargement of the opening, no roughness or thickening of the valves being present, and as the right ventricle does not act powerfully, a murmur is only rarely heard. When present it is *systolic*, faint, and of low pitch. 2. *Obstructive.* This is a mere curiosity, but theoretically it would be *præsystolic* in time.

IV. Pulmonary Artery Murmurs.—These are audible at the *left base*, about the second space and third cartilage or space near the sternum, and are conducted *upwards and to the left*, so as to be heard under the left clavicle. As in the case of the aorta, two murmurs may be met with, but only rarely, viz.: 1. *Obstructive or systolic.* 2. *Regurgitant or diastolic.*

Conditions influencing Murmurs. Without entering into particulars, it must suffice to state that murmurs may be modified as regards their intensity, seat, direction of conduction, and other characters by: 1. Deformity of the chest. 2. Posture. 3. Morbid conditions external to the heart, *e. g.*, emphysema, pleuritic effusion, lung-consolidation. 4. The state of the walls of the heart, and of its cavities, as regards hypertrophy, dilatation, degeneration, &c. 5. The force and regularity of the cardiac action. 6. The presence of two murmurs at the same orifice. 7. The existence of two synchronous murmurs at different orifices.

Inorganic Murmurs.—1. *Anæmic.* This has usually the characters of a faint *pulmonary systolic* murmur, somewhat blowing or whiffing in quality. It may, however, be aortic, and some have even localized it in the tricuspid or mitral orifice. Excited action of the heart, pressure with the stethoscope, and the erect posture intensify it. The chief theories of its causation are, that it is due entirely to the abnormal state of the blood; to pressure by the stethoscope; or to unusual vibration of the walls of the artery or the valves, in consequence of their relaxed condition. Probably all these aid in its production. 2. *Murmur resulting from irregular action of the musculi papillares in the left ventricle.* Of the nature of a slight, but inconstant *mitral regurgitant murmur*, it is ually associated with chorea, but may depend upon a very feeble, or regularly-acting heart. 3. Excited cardiac action or irregular palpita-on, especially if associated with enlargement of the heart, may cause e first sound to become rough and murmur-like, particularly at the ase. 4. Twisting of the heart may give rise to a *basic systolic murmur*. External pressure generally produces an *aortic obstructive murmur*, but ccasionally it is *pulmonary*. 6. Murmurs due to clots in the heart are sually systolic, and connected with the right side.

C. PERICARDIAL MURMURS OR FRICTION-SOUNDS.

A *friction-sound* is often produced during the cardiac action, by the ubbing together of roughened surfaces of the pericardium. The roughess may be due to *excessive vascularization, exudation or its remains, hæmorrhage, tubercle*, or *cancer*.

CHARACTERS.—In the following description of a *pericardial murmur*, the differences between it and an *endocardial murmur* will be evident. 1. Its *seat* and *extent* are very variable, depending upon the area over which the physical conditions for its production are present, but frequently its *point of greatest intensity* does not correspond to that of any endocardial murmur; while it is usually *abruptly limited*, even when loud, and is *not conducted* in the directions of endocardial sounds. 2. It appears *distinctly superficial* as a rule. 3. Great variety is observed as regards *intensity, quality*, and *pitch*. Usually the sound is more or less *rubbing* and *rough* in quality, but may be clicking, creaking, grating, &c., and Dr. Walshe describes *churning* and *continuous rumbling* murmurs, due to the presence of fluid. It may differ over different parts of the heart. 4. The *rhythm* may be *systolic*, diastolic, or both, but very often it is *irregular, not corresponding exactly to either*, and *varying with each beat of the heart. A double murmur of maximum intensity at the same spot*, is considered very characteristic of *pericardial*. In many cases the *sounds* may be heard quite distinct. 5. *Pressure with the stethoscope* frequently materially modifies a pericardial murmur, by increasing its area, altering its rhythm, raising the pitch, or rendering it rougher in quality. 6. *Bending the body forwards* is said to intensify it, but this is not reliable. It may disappear in the sitting posture, and a change in position may alter the murmur, should fluid be present in the pericardium. 7. A quick inspiration in some cases intensifies the murmur and raises its pitch. 8. *Rapid changes* are liable to take place in the progress of the case, as regards the site, extent, rhythm, and characters of a pericardial murmur.

It is necessary to mention that *pericardial friction-sound* may be simulated by *pleuritic*, produced by the movement of the heart. Its position, which is generally about the left border of the heart, marked irregularity, and *cessation when the breath is held*, will usually serve to distinguish the latter.

A *pericardial splashing sound* has been described, due to the presence of air and fluid, but it is extremely rare.

EXAMINATION OF THE GREAT ARTERIES OF THE CHEST AND NECK.

The main points to be observed in this examination may be thus summarized:

I. *Bulging*, which may be caused by aneurism.

II. *Amount and characters of pulsation as seen and felt.* 1. *Excessive pulsation* may be associated with—*a*. Excited action of the heart. *b*. Hypertrophy of the left ventricle. *c*. Aortic regurgitation. *d*. An atheromatous condition of the vessels. *e*. *Aneurisms* of various kinds, in which there is a *limited excessive impulse*, usually *expansile and heaving*. 2. In cases of *mitral regurgitation*, there is sometimes almost *an entire absence of pulsation* in the carotids and subclavians, even when the heart is much hypertrophied.

III. *Thrill.* This may be associated with—1. Anæmia. 2. Pressure on an artery. 3. Diseased vessels and aneurisms, especially when *general dilatation* exists, with atheroma or calcification. A thrill may be felt in the suprasternal notch, owing to the aorta being in these conditions.

IV. *Increased dulness and resistance* can only be due to an aneurism.

V. *Murmurs.* An arterial murmur is usually synchronous with the *cardiac systole*. *Causes.* 1. *Pressure by the stethoscope*, particularly over the third part of the subclavian, which may produce a murmur even in health, but especially when there is hypertrophy of the heart, aortic regurgitation, or *anæmia*. The *anæmic* murmur is usually very easily induced, high-pitched, blowing, whiffing or whizzing, and may be heard extensively. 2. *Pressure by a tumor, enlarged glands, or fibrous thickenings and adhesions.* One of the best illustrations is the subclavian murmur heard below the left clavicle in some cases of phthisis. 3. *Roughness of the inner surface of an artery*, from atheroma, *calcification*, erosions, exudation, or fibrinous coagula. 4. *Change of form in an artery*, viz., aneurisms (in which the murmur may be systolic, diastolic, or both), and coarctation. 5. Abnormal communication between a large artery and vein, such as between the aorta and superior vena cava.

EXAMINATION OF THE VEINS OF THE NECK AND OVER THE CHEST.

Special attention should be paid to the *right external jugular* vein, and to the *sinus at the junction of the subclavian and internal jugular.* The following are the important abnormal signs:

I. *Enlargement of the veins.* It is necessary to observe the degree of this, whether it is permanent or variable, and if the vessels are knotted and varicose. *Causes.* 1. *Tricuspid regurgitation.* 2. Obstruction in connection with the superior vena cava, innominate, or more locally, owing to pressure by a tumor, &c., or internal plugging by a thrombus. 3. An aneurism communicating with a large vein in the thorax.

II. *Excessive distension of the veins of the neck after a cough.* During coughing these veins always fill more or less, but when they are dilated *and the valves are inefficient,* they swell greatly when this act is performed, and the degree of imperfection in the valves may often be thus indicated.

III. *Pulsation and filling from below.* Some believe that these characters can be seen even in healthy persons, but they are scarcely appreciable as a rule. In order to observe them, *the patient should be recumbent, with the head low.* Generally pulsation can only be seen, but when very powerful it may also be felt, and it is said that a *thrill* may be present in rare instances. Care must be taken not to mistake *transmitted arterial pulsation* for venous. In order to detect *filling from below,* it is requisite to press upon the *right external jugular* near the clavicle, and then draw the finger up the neck in its course, keeping up the pressure; it usually fills in jerks. *Causes.* 1. *Tricuspid regurgitation* alone may lead to pulsation, but usually is soon associated with—2. *Inefficiency of the valves of the veins,* which renders the pulsation more marked, and which must exist before there can be any filling from below. 3. *Right hypertrophy* considerably intensifies the pulsation.

IV. *Venous murmurs.* 1. *Venous hum,* "*bruit du diable.*" This is the only venous murmur which is at all likely to be met with, and it is very common in connection with *anæmia,* being sometimes associated with a *thrill.* Best heard at the junction of the *right* internal jugular and subclavian, especially on twisting the neck a little to the left; it may, however, be extensively diffused. *Characters.* It is *continuous* and *not interrupted,* though not uniform in its intensity; usually humming or musical, it may be blowing, buzzing, rushing, whistling, &c. Inspiration, pressure, and the erect posture, intensify this murmur, and it is loudest during the ventricular systole, being in proportion to the force and rapidity of the current of blood. 2. *Intermittent murmurs* have been described, associated with tricuspid regurgitation, hypertrophy of the heart, and other morbid conditions, but they must be extremely exceptional.

CHAPTER VI.

DISEASES OF THE RESPIRATORY ORGANS AND PASSAGES.

General Clinical Characters.—Apart from the results of *physical examination*, the presence of disease connected with the different parts of the respiratory apparatus is indicated by some characteristic subjective and objective symptoms. 1. As a rule various *morbid sensations* are present, either in some part of the course of the respiratory tract, or in the chest. 2. *Breathing* is often disturbed, there being more or less *dyspnœa*, differing in its characters according to its cause. 3. *The voice* is affected when the larynx is implicated. 4. Certain acts are excited, which have for their object the removal of some irritation, viz., *coughing*, *hawking*, or *sneezing*. 5. Various substances may be discharged during these acts. 6. *Hæmoptysis* is not uncommonly present. 7. The *expired air* sometimes affords unusual characters. Some of these symptoms call for more detailed general consideration in this place; others will be noticed further in subsequent chapters.

Dyspnœa.—Apnœa and its Results.

Dyspnœa or *difficulty of breathing*, is a symptom requiring careful investigation, as it may be made up of several elements which it is important to distinguish, as well as to localize the cause of the disturbance, which is not necessarily situated in the respiratory organs. *Causes.* The conditions which give rise to dyspnœa may be thus arranged. 1. *Interference with the entrance of air through the air-passages*, from internal obstruction, spasmodic or other stricture, or external pressure. This may exist in any part, from the mouth down to the bronchi. 2. *Mechanical interference with the expansion of the chest-walls from pressure or rigidity;* or with the movements of the diaphragm. 3. *Loss of the muscular inspiratory power* owing to paralysis or spasm. 4. *Deficient expiratory force, as the result of loss of elasticity of the lungs in emphysema*, or fixation of the chest-walls. 5. *Diminution in the working portion of the lungs*, from actual destruction, consolidation, liquid accumulation in the air-cells and minute bronchi, collapse, external compression, or obliteration of its minute vessels. 6. *Affections of the chest or abdomen*, which render the movements of respiration painful. 7. *Improper conditions of the air inspired*, such as its being too rarefied, or containing irrespirable gases. 8. *Excessive or deficient supply of blood to the lungs*, due to some *organic or functional derangement* *of the heart*, obstruction in the pulmonary vessels, actual loss of blood, or violent exercise. 9. *Altered quality of the blood*, associated with anæmia, imperfect aeration, or the presence of poisonous ingredients in fevers, renal diseases, pyæmia, diabetes, &c. 10. *Nervous disturbance*, in connection with hysteria, strong emotion, cerebral disease, brain-poisoning, pressure on the vagus nerves or some of their branches, or reflex disturbance.

CHARACTERS OF DYSPNŒA.—In studying any case in which there is apparent dyspnœa, it is requisite to observe the following points: 1. Whether *any subjective sensation of want of air* is experienced, as well as its degree, which may amount to a feeling of suffocation. 2 The rapidity of the breathing. 3. Whether respiration is increased in depth and force. 4. If the relative lengths of inspiration, expiration, and the interval are disturbed. 5. If there are objective signs of great want of breath, as indicated by *the posture*, by *the extraordinary muscles being brought into play*, by *working of the alæ nasi*, or *by an inability to hold the breath or speak*. 6. Whether any noise is produced during the act of breathing, *e. g.*, stridor, or rattling. 7. *If air enters freely into the lungs or not.* Deficient entrance of air is indicated by the sinking in of the lower part of the chest, epigastrium, and suprasternal fossa during inspiration. 8. *The existence and degree of signs of imperfect blood-aeration.* 9. Whether the dyspnœa is constant, entirely paroxysmal, or subject to exacerbations, and if the paroxysms are traceable to any evident cause, such as effort, emotion, taking food, cold air, &c.

SIGNS OF APNŒA.—The phenomena which accompany interference with the respiratory functions are due partly to overloading of the venous portion of the circulatory system, and deficient supply of blood to the arterial portion; but chiefly to the blood being imperfectly aerated, and therefore overcharged with carbonic acid, which acts as a poison, especially to the brain and spinal cord. At first more or less violent efforts are made to breathe, according to the cause of the dyspnœa, but these diminish and finally cease as the central nervous system becomes poisoned. The face is turgid, at first flushed, but soon purple or livid, or, under some conditions, it is deadly pale or mottled, with lividity of the lips, nose, and about the eyes. Other parts are also blue or livid, especially the nails and other distant parts. Distension of the veins is observed, and the eyes tend to be prominent, suffused, and watery. The temperature becomes reduced, while cold, clammy sweats break out. Nervous symptoms soon set in, viz., at first vertigo, disturbance of the senses, mental wandering, twitchings and tremors; followed by drowsiness and stupor, ending in complete coma, convulsions, and then relaxation of the muscles, including the sphincters. The pulse is feeble, frequent, and small, but it continues to beat after respiration has stopped, and the heart may be still acting after the pulse has ceased to be perceptible; finally it stops also if the case is fatal.

Post-mortem examination reveals distension of the right side of the heart and of the veins with dark blood; with intense venous congestion of all the organs and tissues, and its consequences.

COUGH.

Causes. *Cough* is a very common symptom, but its causes may be summed up under the following heads: 1. *An irritable condition of the mucous membrane* in some part of the passage for the entrance of air, but especially in the throat and *larynx*. This is particularly observed in connection with *inflammation*, the sensibility being then much exalted. 2. Most commonly *cough is an act for the expulsion of some source of irritation or annoyance in the throat, larynx, trachea, or bronchi*. It may be due to morbid conditions of normal structures, such as the uvula, tonsils, epiglottis, or vocal cords; the presence of irritating particles, or larger foreign bodies introduced during inspiration; certain conditions of the air inhaled, such as a very low temperature, or impregnation with irritating gases; or the collection of secretion or morbid products, *e. g.*, serum, mucus, pus, blood, croupous or diphtheritic deposit, &c. This cause is frequently associated with *increased irritability*, especially in inflammation. This form of cough may be voluntarily excited, but it is often involuntary and irrepressible, especially when the irritation *is in the neighborhood of the glottis*. 3. *Reflex cough*. In many cases cough is produced by *reflex irritation*, but before deciding that this is its origion, it is well always to look carefully for some more immediate cause. The source of irritation may be in the lungs or pleuræ; heart or pericardium; alimentary canal (*e. g.*, dyspepsia, dentition, worms); liver; peritoneum; ear; female generative organs; or external surface. 4. *An unhealthy condition of the blood* is supposed to give rise to cough, by its effect on the nervous system, *e. g.*, that associated with gout or rheumatism. Frequently, however, there is some local cause in these cases. 5. Cough may depend upon *nervous disturbance*, such as that which occurs in hysteria, brain-disease, or from irritation in connection with the respiratory nerves.

CHARACTERS OF COUGH.—This symptom requires investigation with respect to the following particulars: 1. The frequency of its occurrence, and whether it is constant or paroxysmal. 2. The severity and duration of the fits. 3. The mode of onset, whether the cough is a voluntary act or involuntary and irrepressible, preceded by a sense of irritation in any part; or if it is brought on by some obvious cause, such as exertion, change of posture, inhalation of cold air, &c. 4. It is very important to notice the characters of a cough, and the sounds which are produced during the act, both in inspiration and expiration. The chief varieties are hacking, hoarse, wheezing, barking, ringing, metallic, croupy, hooping, crepitous, and aphonic. 5. If it is *dry*, or attended with expectoration. In the latter case it is necessary to ascertain whether expectoration is effected easily or with difficulty; and also to make *a personal examination* of the sputa, observing—*a*. Their *quantity*. *b*. *General characters* as to color; odor; whether in one mass or in separate lumps, with the size and shape of the latter; transparency or opacity; amount of frothiness; consistence and degree of adhesiveness. *c*. If any special substances are evident to the naked eye, such as blood, fibrinous casts, calcareous substances, &c. *d*. *Microscopical characters*. *e*. *Chemical composition* in some cases. 6. If the cough terminates in vomiting, or is followed by relief of any previous unpleasant symptoms.

HÆMOPTYSIS.

Hæmoptysis, or "spitting of blood," signifies the discharge of blood through the mouth, from any part of the air-passages below the upper opening of the larynx. It may come on without any warning, or be preceded by premonitory symptoms, such as weight or fulness about the chest, dyspnœa, a sense of heat, tickling in the throat, or a saltish taste. Usually the blood is brought up by coughing, but it may arise in gulps without any effort, or sometimes comes in a sudden gush, when it may even escape through the nose as well. Not unfrequently vomiting is excited. The *quantity* varies from a few streaks in the sputa to an amount sufficient to cause instant death.

The blood is generally bright and florid, and more or less frothy, but occasionally it is dark and non-aerated, especially when abundant and suddenly discharged. Clots may be observed, but the greater portion is usually liquid. There is no change in the blood, either as regards its general or microscopic chararacters, as a rule. The duration of an attack of hæmoptysis varies greatly, but after the more urgent symptoms have subsided, the sputa are generally tinged for some time. Recurrence frequently happens, and is in some cases periodical.

If the blood comes from the lungs in any quantity, *moist râles* are generally heard over some part of the chest.

The effects on the general system will depend on the amount of blood lost, and the rapidity and duration of its discharge, as described when treating of hemorrhages in general. Death does not often result immediately from hæmoptysis, but may occur either from the direct loss of blood, or from its causing suffocation. Frequently some febrile excitement is associated with hæmoptysis, the pulse being full and bounding, but soft. Should any blood remain in the lungs, it is liable to set up inflammation, and there is strong reason to believe that in this way it may originate phthisis.

ETIOLOGY.—The sources of the blood in hæmoptysis, and the morbid conditions in which it may originate, may be thus classified: 1. In some instances *there is no obvious local disease.* In this group may be included hæmoptysis from going up a height, severe straining, coughing, blowing wind instruments, &c., which is especially apt to occur in those who are delicate and whose tissues are weak; vicarious hæmoptysis; that due to the inhalation of irritating substances, or to injury; and that dependent upon an unhealthy state of the blood, *e. g.*, scurvy or purpura. 2. *Diseases of the larynx, trachea, or bronchi, e. g.*, congestion, inflammation, ulceration, morbid growths, especially cancer. 3. *Diseases of the lungs*, viz., congestion, acute or chronic pneumonia, abscess, gangrene, hydatids, *phthisis, cancer.* 4. *Mediastinal tumors*, including tubercular and cancerous glands, opening into the air-passages 5. *Cardiac diseases*, viz., mitral disease, hypertrophy of the right ventricle, or a weak dilated left ventricle. 6. *Disease of the pulmonary vessels.* 7. *Aneurism opening into the air-passages.* 8. It must be remembered that blood sometimes gets into the windpipe from the throat or nose, and is then expectorated.

Hæmoptysis generally takes place from the capillaries, but not unfrequently a considerable branch of the pulmonary artery either gives way, or is perforated by erosion. In phthisis minute aneurisms have been found upon the branches of this vessel, which have ruptured, and thus given rise to large hemorrhages.

There may be no immediate *exciting cause* of hæmoptysis, or it is brought on by exertion, coughing, &c.

DIAGNOSIS—Hæmoptysis may be simulated by bleeding from the mouth or throat, or by epistaxis. The quantity and characters of the blood discharged; the mode of ejection; and, above all thorough examination of the nose, mouth, and fauces, as well as of the chest, will generally indicate the source of the bleeding. The part of the respiratory organs from which the blood escapes is also usually ascertained by physical examination, and by the local symptoms present. Erosion of a large branch of the pulmonary artery is characterized by the coughing up of a quantity of dark blood. The diagnosis of hæmoptysis from hæmatemesis will be pointed out after the latter symptom has been considered.

TREATMENT.—Hæmoptysis must be treated on the same principles as hemorrhages in general, but its management will necessarily vary according to its cause. Ordinarily, when the blood escapes from the lungs, the chief things to attend to are, to keep the patient entirely at rest in a cool room, a recumbent posture being adopted, with the head rather high; to subdue cough as much as possible; to give ice to suck freely; and to administer astringents with vascular sedatives. Gallic acid in full doses with opium every two or three hours, acetate of lead and opium, dilute sulphuric acid and alum, turpentine, and ergot of rye, are the chief remedies recommended. At the Brompton Hospital we find the gallic acid and opium mixture very serviceable. The subcutaneous injection of ergotine has been recently advocated. Digitalis is most valuable, if the heart is acting excitedly. Saline aperients are useful if there is any plethora. Some have recourse to venesection, or local abstraction of blood, but this is rarely a desirable plan of treatment. The application of ice to the chest is often exceedingly beneficial, but it must be done carefully, the ice being removed by degrees. Dry cupping over the chest is serviceable in some cases. It is sometimes useful, when a case does not yield to ordinary treatment, to draw the blood towards the limbs by means of hot foot-baths or a Junod's boot, or to apply ligatures around them. In hemorrhage vicarious of menstruation, or due to stoppage of bleeding from piles, the application of leeches to the lower extremities or around the anus is said to do good. In all cases of hæmoptysis of any moment, it is important to keep the patient under observation until all irritation due to the presence of the blood in the lungs has subsided. If there is any tendency to spitting of blood, everything likely to bring on an attack must be avoided, while the condition of the blood is improved by proper dieting and the administration of tincture of steel.

CHAPTER VII.

In the present chapter two affections will be described, viz., *hooping-cough* and *influenza*, about the nature of which there is a difference of opinion, but it is convenient to consider them here, as their symptoms are associated chiefly with the respiratory organs.

HOOPING-COUGH—PERTUSSIS.

ETIOLOGY.—Hooping-cough is generally regarded as an *infectious* disease, depending upon a *specific poison*, which may pass to a considerable distance, or be conveyed by fomites. It is chiefly given off in the breath. The disease generally occurs in an epidemic form, but may be sporadic. A second attack is scarcely ever observed.

The chief *predisposing causes* are childhood, especially after the second year; a cold and damp season or climate; and exposure to all causes of "cold."

ANATOMICAL CHARACTERS AND PATHOLOGY.—Most authorit regard hooping-cough as a peculiar catarrh of the mucous me brane of the air-passages, attended with hyperæsthesia; oth think that it is either entirely or partly due to some morbid c dition in connection with the vagus nerve. There may be eviden of catarrh after death, but frequently they are absent. Th who advocate the nervous origin of the disease have descri appearances of inflammation about the vagus nerves, enlar g bronchial glands pressing upon them, or congestion of the medul oblongata and its membranes. In most cases, however, none these are observed. The most important morbid conditions associated with hooping-cough are those which are present as complications, viz., lobular collapse of the lungs, acute insufflation or emphysema, dilatation of the bronchi, and catarrhal pneumonia. Rarely, croup or meningitis may be present.

SYMPTOMS.—Three stages are recognized, following an uncertain *period of incubation.*

1st, or Catarrhal Stage. At the commencement there are no characteristic signs, there being merely pyrexia, which is often sharp, accompanied with signs of catarrh, viz., running from th nose, sneezing, redness of the eyes, frequent and usually seve paroxysms of cough, at first dry, but soon attended with a peculi expectoration. This stage may last from two days to two or th weeks or more, and in proportion to its duration and sever will usually be the intensity and duration of the entire diseas

2d, or Spasmodic Stage. When the disease is fully establi fits of spasmodic cough come on, which are quite characte A paroxysm generally sets in abruptly without any obvious being in many cases preceded by a sensation of tickling throat, or some other unpleasant feeling. The cough i severe and distressing, consisting of a number of short spasmodic or convulsive, and forcible expiratory puffs, f by a prolonged, clear, shrill inspiratory sound, or "hoo alternating for a variable number of times; if the fit i long duration, the cough at last becomes inaudible. It terminated by the expectoration of a considerable q thick, viscid, clear sputa, which may also be discharge the nose, and not uncommonly vomiting takes place.

being interfered with, the child presents the appearances due to non-aeration of the blood, and venous congestion, and in prolonged attacks may become almost asphyxiated. Usually there is a feeling of much exhaustion, with soreness about the muscles of the chest, after a paroxysm, but these soon pass away. As accidental occurrences there may be bleeding from the eyes, nose, mouth, ears, or rectum; involuntary discharge of urine and fæces; hernia, or prolapsus ani; or convulsions. *Physical examination* during a fit reveals that air does not enter the lungs properly, the chest falling in, and the pulmonary breath-sound being inaudible or very feeble. There may be the physical signs of complications. As already described, the chest may become ultimately permanently deformed. In the intervals mucous râles are often heard.

The *frequency* and *duration* of the paroxysms vary greatly, the one being generally in proportion to the other. As a rule the disease becomes more severe up to a certain point, attaining its height at about the end of the third, fourth, or fifth week, and then subsides gradually.

During the intervals the patient is usually apparently well, but in severe cases there may be prolonged exhaustion, languor and debility, loss of appetite, headache, sleeplessness, pyrexia, &c., or various complications may give rise to their special symptoms.

3d, *or Decline Stage.* There is no sudden transition to this stage, but a gradual diminution in the frequency and intensity of the fits, while the cough loses its special characters, and expectoration becomes more easy, the sputa being opaque, and muco-purulent, like those of ordinary bronchial catarrh. At the same time vomiting ceases, and the health improves. Finally the cough stops altogether, and the patient is convalescent.

COMPLICATIONS AND SEQUELÆ.—Some of these are directly due to the cough, others are accidental. The chief of them are *bronchitis*, which may be *capillary; lobular collapse; emphysema or insufflation;* rupture of air-vesicles, with subcutaneous emphysema; *catarrhal pneumonia;* pleurisy; phthisis; tuberculosis; croup; *convulsions;* cerebral apoplexy; meningitis; hernia; gastritis, or enteritis, with obstinate vomiting and diarrhœa; other specific diseases.

DIAGNOSIS.—In the early period it is not possible to diagn hooping-cough with certainty, but it may be suspected if cough has a violent, spasmodic character; if the pyrexia marked and prolonged; and if the disease is prevalent. W fully established the peculiar cough and expectoration disting this affection from all others.

DURATION AND TERMINATIONS.—The duration is very varia but from six to eight weeks is stated to be the average. The t stage may continue for an indefinite period, and a *relapse* not frequently occurs. Most cases terminate in recovery, but dea is not an uncommon event, being occasionally due to the severi of the disease, but usually to complications. Some permanen organic mischief, or deformity of the chest, is often left behind.

PROGNOSIS.—Hooping-cough is always a serious disease, and calls for a guarded prognosis. The general circumstances which increase its gravity are very early age, dentition, constitutional debility, residence in a large town, poverty, and epidemic prevalence. It is more dangerous in proportion to the number and severity of the paroxysms, the degree of pyrexia, and according to the complications present.

TREATMENT.—Numerous specific remedies have been brough forward for the treatment of hooping-cough, but they all fail most cases, the disease running its course unchecked, though may be mitigated in its severity. The chief indications are To prevent or subdue the paroxysms of cough, at the same t taking care that there is no accumulation of secretion in the chial tubes. 2. To obviate all complications, and treat th they arise. 3. To attend to the general health, and to the of the secretions.

It should be a constant rule in the case of children to *mediate attention* to any chest symptoms, and this applie early period of hooping-cough. The patient should be a warm room, be well clad in flannel, and have warm d order to promote perspiration. An aperient may be clear out the alimentary canal, and a mixture conta ammon. acet. and vin. ipecac. be administered.

In the second stage, when the nature of the disease the most important remedies are sedatives and anti for allaying the paroxysms of cough. These must be given in minute doses, and their effects closely watched. The most efficient are belladonna, in the form of tincture, extract, powdered leaves, or root; opium, syrup of poppies, or morphia; hydrocyanic acid; conium; hyoscyamus; tincture of lobelia; cannabis indica; ether; chloroform; valerian; musk. The alkaline carbonates are believed to be useful, and either of them may be combined with one of the above remedies. In the out-patient practice of University Hospital I have found a mixture of vin. ipecac. and hydrocyanic acid (m. ¼ to m. ½) as efficacious as anything else. Some advocate inhalation of chloroform or ether.

Of the various specific remedies advocated the chief are alum (which is in some cases decidedly valuable), dilute mineral acids, especially nitric, cochineal, arsenic, nux vomica or strychnine, bromide of potassium or ammonium, infusion of clover, and repeated emetics. The last are useful if there is any tendency to accumulation of secretion in the bronchi. Metallic salts, of copper, zinc, iron, and silver, have been recommended by various authorities, but they are most useful in those cases which tend to become chronic.

Local applications have been tried, viz., touching the larynx with a strong solution of nitrate of silver; counter-irritation to the chest, or along the vagus nerve; friction with opium, belladonna, and other liniments over the chest; and the application of a belladonna plaster. They are of doubtful benefit.

The *general management* is important. In bad weather the child should be confined to the house altogether, or even one room, at a uniform temperature, but in favorable seasons fresh air, during the warm part of the day, is advisable. The clothing must be sufficiently warm. It is important to attend to the diet, and to the state of the alimentary canal; should dentition be proceeding, the teeth must be looked to. Elder children may be taught to suppress unnecessary cough as much as possible.

Complications must be watched for and treated as soon as they arise. All that can be said about them here is, that *inflammatory affections do not bear lowering measures well in this disease*, but, on the contrary, supporting treatment is needed.

During convalescence tonic remedies, especially iron and quinine, are useful. A change of air is also found to be most benefi in prolonged cases, or a sea-voyage. Good diet is needed, wi[illegible] little wine.

There is no protection against hooping-cough, except in rem[illegible] from the source of infection. Vaccination was formerly co[illegible]ered as prophylactic, but it is not so.

INFLUENZA—EPIDEMIC CATARRH.

ETIOLOGY.—Influenza always occurs in an epidemic form, and usually attacks a large number of persons, either simultaneously or in rapid succession. Often it breaks out in several parts of a district at the same time. It generally progresses in a certain direction, and is said to have a cyclical course; frequently, however, it prevails over a very large area. The inhabitants of large towns are chiefly affected, especially in those parts which are low, damp, overcrowded, and in other unfavorable hygienic conditions. Sometimes the disease breaks out even at sea. It is very prone to influence the characters of other affections.

The immediate cause of influenza is believed to be a *specific poison,* which is conveyed only by the atmosphere. The nature of this is doubtful. Some regard it as a virus, and believe tha the complaint is infectious; others consider it to be malaria and non-infectious. Inoculation cannot be effected. Vario hypotheses have been started to explain the occurrence of e demics, but none of them are satisfactory. They occur at seasons, but sudden changes of temperature are said to favor t development.

The chief *individual predisposing causes* are the female slightly, adult and advanced age, a low condition of the sy exposure to cold, and, it is said, chronic lung and heart dis The presence of some acute disease is believed to afford p tion. One attack does not exhaust the susceptibility to t ease in future epidemics, and some are of opinion that it increases the liability.

ANATOMICAL CHARACTERS.—The usual morbid appe in influenza are those of catarrh of the nose, and its comn ing sinuses, conjunctivæ, mouth, throat, and respirato

In severe cases, capillary bronchitis, pulmonary congestion, and œdema, or pneumonia, may supervene, the last often involving both lungs. Sometimes the lining membranes of the entire alimentary canal, and genito-urinary apparatus are affected. Occasionally pleurisy or pericarditis occurs, and very rarely meningitis. There is no splenic enlargement.

SYMPTOMS.—Influenza is a disease running a specific and determinate course, characterized by pyrexia, with much constitutional disturbance and local symptoms, due to the affection of the mucous membranes. The *period of incubation* may be inappreciable, or may extend to two or three weeks. It will be convenient to describe the symptoms as *general* and *local.*

General.—These usually precede the local symptoms, but not always. The onset is often markedly sudden, but in other cases it is gradual. At first there is chilliness, lassitude, pains in the limbs, and, in some cases, intense headache, or nausea and vomiting, followed by fever, which is usually high, the skin being very hot and dry, as a rule, but sometimes there is much sour perspiration. At the same time, there is *a great sense of prostration and debility,* apathy, lowness of spirits, mental inaptitude, with severe aching and shooting pains in various parts of the body, especially in the chest, back, limbs, and neck, headache, giddiness, and general restlessness. The pulse is at first frequent, full, and bounding, but soon tends to become soft, weak, and slow. The urine is febrile. The pyrexia generally presents evening exacerbations, and is said to be in some districts intermittent. In uncomplicated cases its duration usually varies from four to eight days, a critical perspiration, abundant urine with deposit of lithates, or diarrhœa, frequently bringing it to a close, but it may subside gradually.

Local.—These vary according to the seat and extent of catarrh of the mucous membranes. Usually it begins in the nose and conjunctivæ, and spreads downwards. The nose feels hot and dry at first, and the eyelids smart. Soon a watery, acrid discharge flows abundantly, and there is much sneezing, the sense of smell being impaired or lost; occasionally profuse epistaxis occurs. The mouth, tongue, and throat feel sore, and taste is defective. Severe pain is experienced across the forehead, owing to the state of the frontal sinuses. There may be pain along Eustachian tube, with noises in the ears, and some deaf Examination reveals redness of the visible membranes, and o herpes is seen about the lips. The symptoms indicating in cation of the air-passages are hoarseness, soreness, and tick along the larynx and trachea, more or less dyspnœa, oppres and stuffiness across the chest, paroxysmal cough, at first d but afterwards attended with bronchitic expectoration. The catarrhal symptoms usually subside from the fifth to the sevent day, the materials discharged undergoing the ordinary changes observed in the course of a catarrh. As in all febrile conditions, the tongue is furred, and there is much thirst, with loss of appetite. If gastro-enteric catarrh sets in, this is evidenced by epigastric pain and tenderness, redness of the tongue, nausea and vomiting, and diarrhœa.

Cases differ much in their severity, and not unfrequently serious lung-complications arise, especially capillary bronchitis and pneumonia, which are accompanied by their special signs, and which greatly aggravate the danger, being often attended with the phenomena of apnœa. Pneumonia is apt to come on insidiously, without any prominent symptoms. In these and other cases there is sometimes a tendency to adynamia, the tongue becoming brown and dry. Nervous symptoms are occasionally ver prominent, viz.: delirium, stupor, and convulsions.

Diagnosis.—The epidemic nature of this disease, marked fev with great nervous depression, and catarrhal symptoms, s ciently characterize it.

Duration and Terminations.—Uncomplicated cases erally begin to convalesce from the fifth to the tenth day, bı duration may be much prolonged by complications. The majority of cases end in recovery, but convalescence is ofte tedious, and various sequelæ are apt to remain, viz., great d and nervous depression, neuralgic and rheumatic pains, are common about the head and neck, persistent cou occasionally bronchitis and emphysema, chronic laryn phthisis is set up. Death is usually the result of lung-c tions, but sometimes occurs from adynamia.

Prognosis.—The circumstances which make influe are, very early or advanced age; a feeble constitution; the presence of chronic pulmonary or cardiac disease; severe lung-complications, with great dyspnœa, inability to expectorate, and signs of apnœa; nervous disturbance; evidences of weak circulation; adynamic symptoms. Some epidemics are much more serious than others.

TREATMENT.—It has been satisfactorily proved that lowering treatment is injurious in influenza. In all cases it is advisable to keep the patient in-doors, in a cool, well-ventilated room, but protected from draughts. At the outset a purgative is useful, and in adults a dose of calomel seems to be beneficial, but repeated purgation is decidedly to be deprecated. Some recommend an emetic at the commencement, but such treatment is only indicated if there is much nausea. The diet must depend on the nature of the case; if it is slight, a moderate quantity of beef tea and milk may be allowed, but in severe cases, with much depression, a considerable amount of liquid nourishment is required. It is found that it is better to give things cool, and cold or iced drinks are very grateful, and may be freely allowed. Dr. Parkes recommends a highly diluted solution of nitrate of potash, with lemon-juice and sugar. Stimulants are not required at first, unless there is much debility, except in old persons, who generally need them early; in some instances large quantities of wine or brandy are called for, but they must be used cautiously. Quinine is a remedy that is usually well borne, and does much good; it is most valuable towards the decline of the disease, but may be given throughout.

The catarrhal symptoms are best relieved by inhalations of steam, to which some add ether, chloroform, conium, &c. Dr. Parkes suggests that direct local applications to the nasal mucous membrane and throat might be useful. For the bronchial catarrh, ipecacuanha wine, in full doses, answers best, and it may be combined with some sedative, such as henbane or conium, care being taken that there is no accumulation of secretion. Opium should not be employed, as a rule, until the later stages, and its effects must be carefully watched, if it is given. Poultices, sinapisms, and warm or anodyne fomentations to the chest, are often valuable. If capillary bronchitis or pneumonia should set in, stimulant treatment is decidedly indicated. Bleeding and tartar emetic cannot be borne, but ammonia, with decoction of bark or senega, and chloric ether, camphor, and such remedies are to be employed, as well as alcoholic stimulants. Free dry cupping is often valuable. The patient must be encouraged to cough, if capillary bronchitis is present, in order to get rid of the secretion, and should this collect, an emetic must be given.

If the pains are severe, iodide of potassium with quinine is often useful. It may be necessary to give opium, and perhaps subcutaneous injection of morphia might be attended with benefit. Some recommend colchicum.

Severe pyrexia may be relieved by cold sponging. Cold to the head, and the application of two or three leeches might be necessary, should dangerous nervous symptoms be present.

During convalescence tonics are needed, especially quinine and iron, with nourishing food and wine or beer. Change of air is very beneficial, and the patient must wear flannel, and guard against taking cold. Expectorant remedies are often required at this time, and excessive cough must be allayed by opiates.

CHAPTER VIII.

AFFECTIONS OF THE LARYNX AND TRACHEA.

Clinical Characters.—The larynx is subject to serious functional as well as organic disorders, and both it and the trachea may be affected by morbid conditions external to them, *e.g.*, tumors. Laryngeal diseases may be indicated by the following clinical phenomena: 1. *Morbid sensations*, either mere uneasiness, soreness, or actual pain of variable characters, burning, irritation, or a feeling of the presence of a foreign body. These are increased by any local disturbance, such as occurs during coughing, speaking, or singing. External tenderness is sometimes present, especially on pressing directly backwards. 2. *Deglutition* is often somewhat uneasy or painful, but not difficult to perform, as a rule, though it may be so if the epiglottis is destroyed. 3. *Breathing* is generally affected, more or less, being in many cases seriously interfered with. The act is frequently noisy, hissing, whistling, or stridulous, prolonged, and labored.

There may be signs of urgent dyspnœa, with indications that little or no air enters the lungs during inspiration, especially in children. Dyspnœa may be constant or only paroxysmal, sometimes coming on very suddenly, and it is always liable to exacerbations. In some conditions *expiration* is unaffected. 4. *Cough* is a prominent symptom. It is irritable, and tends to come on in distressing fits; difficult to repress; hard, hoarse, cracked, croupous, metallic, barking, or aphonic; dry, or attended with expectoration, which may be abundant, consisting of mucus or muco-purulent matter, or containing blood, pus, croupous or diphtheritic deposits, detached portions of growths, or laryngeal structures, according to circumstances. In many cases there is a constant desire to cough, in order to clear away some obstruction. 5. The *voice* is altered in various ways. It may be more or less weak, to complete aphonia; altered in quality, being rough, harsh, hoarse, croupy, or cracked; or changed in pitch or range. 6. *Physical examination* is most valuable in investigating laryngeal and tracheal affections. This comprehends—*a. External examination of the neck and chest*, which may reveal the presence of any tumor or fistula. The only direct modes of examination over the larynx or trachea that can be of much use are *palpation* and *auscultation;* by the aid of the latter the breath-sounds may be observed to be harsh, whistling, &c., and local rhonchi may be heard. *b. Examination of the throat internally.* Much information is often gained by inspecting this part with a good light, there being in many cases similar morbid conditions in the throat and larynx. The state of the epiglottis can also be frequently made out in this manner, or it may be felt by the finger. *c. Examination of the chest*, which will show whether there is any obstruction to the entrance of air into the lungs. *d. Examination with the laryngoscope.* This is the instrument specially employed for determining the state of the upper part of the windpipe, and although it is possible in many instances to come to a tolerably accurate conclusion on this matter without its aid, yet by it alone can we ascertain the exact conditions present, and therefore it ought always to be employed in the investigation. It is also useful in applying local remedies and performing operations. Much practice is required before the instrument can be effectually made use of.

The *laryngoscope* consists of an apparatus for illuminating the back of the throat, and a small mirror, which is introduced into this part in such a way as to reflect an image of the interior of the larynx. Illumination is usually effected by *reflection*, a mirror being attached to the observer's head in various ways, which is made to reflect either solar light, or, usually, that derived from some artificial source. Numerous lamps have been invented, of which one of the best is the "rack-movement lamp," of Dr. Morell-Mackenzie, but any lamp which yields a clear, strong, and steady light will suffice for ordinary purposes. Some employ *direct illumination*, by means of a lamp placed on a narrow table between the operator and the patient, having a powerful lens directed towards the latter, a being screened towards the former. The oxyhydrogen light is most u ful in this way. The *throat-mirrors* are generally circular, varying diameter from half an inch to an inch, but if the tonsils are enlarg oval or ovoid mirrors may be employed. They ought to be made of gla backed with a coating of silver, mounted in German silver, and fixed an angle of about 120° to a slender shank, which is inserted into a handl

Mode of Examination.—The patient sits opposite the observer, with th head inclined very slightly backwards, there being an interval of about a foot between their faces. The lamp is placed at the side of the patient, the flame being on a level with the eyes. The mouth being opened as widely as possible, and the tongue protruded, this is held gently between the thumb and forefinger of the left hand, covered with a handkerchief or a soft napkin. By means of the reflector, the light is then directed to the back of the throat, so that the centre of the disk corresponds to the base of the uvula. The throat-mirror, having been properly warmed over the lamp, is now introduced, being held between the thumb and fingers of the right hand; the reflecting surface is directed more or less obliquely downwards, while the opposite one touches the base of the uvula, which should be pushed gently upwards and backwards. In order to facilitate the introduction of the mirror, it is often necessary to make the patient take a deep breath, or repeat the sound "ah!" Some persons can bear examination for any length of time, if it is properly conducted, but in most cases it is better to introduce the mirror several times in succession, for a few seconds each time.

Morbid conditions observed by the laryngoscope.—It is requisite to become acquainted with the appearances presented by the healthy larynx, as seen by the laryngoscope, before this instrument can be made use of in investigating diseased conditions. The *morbid appearances* which may be perceptible are: 1. Changes in color, due to congestion, inflammation, &c 2 Alteration in the size, shape, and position of the epiglottis. 3. Thick ening of tissues, with irregularity, due to chronic inflammation. Swelling from œdema. 5. Various deposits, especially croupous. Ulcerations. 7. Growths and tumors. 8. Changes in the shape a size of different parts, particularly of the opening of the glottis. 9. I turbance of the action of the muscles of the glottis, as observed dur the act of breathing or vocalization.

For a fuller account of this subject, the reader is referred to the writ of Dr Morell-Mackenzie. An excellent condensed description of th of the laryngoscope is given by him in Reynolds's System of Medi vol. iii, page 467.

INFLAMMATIONS OF THE LARYNX AND TRACHEA.

I. ACUTE LARYNGITIS—CYNANCHE LARYNGEA—LARYNGEAL CATARRH—MUCOUS AND SUBMUCOUS LARYNGITIS—CATARRHAL AND ŒDEMATOUS LARYNGITIS.

ETIOLOGY.—*Predisposing Causes.* The chief of these are adult age; the male sex; a lax and ill-nourished condition of the system; effeminate habits; indoor occupations, or those in which the voice is much exercised; previous attacks, especially if repeated; and a changeable, damp climate or season.

Exciting Causes. 1. This form of laryngitis usually arises from some *direct irritation*, such as the breathing of very cold or hot air, steam, acrid vapors, or air containing irritating particles; or the swallowing of boiling or corrosive liquids. Under this heading may also be included those cases which are due to *excessive coughing* or *violent exercise of the voice* in speaking, shouting, and singing, as well as those depending upon growths and ulcers. 2. It may result from the direct effect of a cold draught upon the front of the neck. 3. Frequently it is a part of a more or less general catarrh, due to "taking cold" in various ways, or occurring during the course of influenza. 4. Inflammation may extend from the nose or pharynx, and occasionally from the bronchi. 5. Laryngeal catarrh is often observed during the course of some of the acute exanthemata, especially erysipelas, measles, and typhus fever. It also forms one of the secondary symptoms of syphilis.

ANATOMICAL CHARACTERS.—According as the inflammation is superficial, or affects the submucous tissue as well, will the appearances differ. More or less bright redness is usually present, with swelling, opacity, and slight softening of the membrane. Spots of epithelial erosion are often observed, but very rarely actual ulceration. After a time secretion forms, containing an abundance of young cells. There is much liability to œdema of the submucous tissue, especially in those parts where this is very lax, which leads to much translucent swelling, with a sodden, flabby condition of the structures, but the redness is then less marked. Very rarely sero-purulent or purulent fluid infiltrates the tissues. In low fevers gangrene may occur.

SYMPTOMS.—1. *Local.* Various unpleasant sensations are experienced in the larynx, such as dryness, roughness, constriction, soreness, burning, or tickling, which are increased by coughing or speaking. These are chiefly felt when the upper part of the larynx is involved. *Swallowing* is often rather painful. *The voice* is hoarse and cracked, soon being frequently quite lost. *Cough* is usually a prominent symptom, there being a constant tendency to paroxysmal attacks. It is harsh and hoarse, or may become completely aphonic. At first there is no expectoration, but after a while a little clear viscid mucus may be expelled with difficulty, containing young cells, which finally becomes more abundant and muco-purulent. *Respiration* is not much interfered with in ordinary cases, but in children, even in simple catarrh, there may be considerable dyspnœa, especially after sleep, in consequence of viscid secretion causing the edges of the glottis to adhere.

The local symptoms will vary with the part of the larynx affected, and the result of the inflammation. In *œdematous laryngitis* there is a feeling of the presence of a foreign body; more marked dysphagia; with urgent dyspnœa, of laryngeal characters, inspiration being whistling or hissing, but *expiration is comparatively or quite easy.* Voice is lost, and cough becomes completely aphonic. It is usually believed that spasm of the glottis aids in the production of dyspnœa, but some think that the muscles are paralyzed.

Physical Examination.—The *laryngoscope* may reveal bright redness, turgidity, swelling of various parts, œdema, or alteration in shape. If the epiglottis is much affected, it prevents inspection of the interior of the larynx. *Œdematous* parts may be seen or felt on mere examination of the throat. On listening over the larynx moist rhonchi are often heard. When œdema is present, there are the signs of non-entrance of air into the lungs during inspiration.

2. *General.* In some cases there are no general symptoms, but usually more or less pyrexia is observed. If the larynx becomes obstructed by œdema or spasm, there are the usual signs of blood-poisoning from apnœa.

Laryngitis assumes very different degrees of severity, and it is important to remember that an apparently slight attack may speedily present most dangerous characters, from the supervention of œdema. That form which is due to the swallowing of boiling liquids is extremely serious and fatal. It is usually met with among the children of the poor, who attempt to drink out of the spout of the tea-kettle. Recovery is the usual termination in ordinary cases, but death sometimes occurs, and it may take place very suddenly, or with great rapidity. The affection may become chronic.

II. CROUPOUS OR PLASTIC LARYNGITIS—TRUE CROUP—MEMBRANOUS CROUP—CYNANCHE TRACHEALIS.

ETIOLOGY. — *Predisposing Causes.* 1. *Age.* Croup is essentially a disease of childhood, most cases occurring from the first to the seventh year; it is very rare after ten. 2. *Sex.* Males suffer more than females. 3. *Constitution.* There is a difference of opinion among observers on this point, but probably delicate, weakly, and ill-nourished children are most liable to be affected. 4. *Individual and family predisposition* are said to have some influence. 5. *Climate and Season.* The conditions most favorable to croup are a cold and moist atmosphere, exposure to cold winds, and rapid changes of temperature. It is most frequent during winter and spring. 6. *Imperfect sanitary conditions* have a material influence as regards the prevalence of croup, and hence the children of the poorer classes are chiefly affected. 7. *Epidemic influence* is believed to act as a predisposing cause occasionally. 8. *Previous attacks* increase the liability to croup.

Exciting. *Idiopathic croup* may often be traced to exposure to direct cold, especially to northerly or northeasterly winds, or to a general chill from various causes. In many cases, however, there is no obvious exciting cause. It has been stated that it may spread by contagion, but this is extremely improbable. A form of croupous laryngitis is occasionally *secondary* to some of the exanthemata, viz., small-pox, measles, scarlatina, typhus, typhoid, and erysipelas. As already described, the larynx is very liable to become involved in diphtheria, and the deposit here is of a croupous nature.

ANATOMICAL CHARACTERS.—The special character of this to the state of the frontal sinuses. There may be pain along the Eustachian tube, with noises in the ears, and some deafness. Examination reveals redness of the visible membranes, and often herpes is seen about the lips. The symptoms indicating implication of the air-passages are hoarseness, soreness, and tickling along the larynx and trachea, more or less dyspnœa, oppression and stuffiness across the chest, paroxysmal cough, at first dry but afterwards attended with bronchitic expectoration. The catarrhal symptoms usually subside from the fifth to the seventh day, the materials discharged undergoing the ordinary changes observed in the course of a catarrh. As in all febrile conditions the tongue is furred, and there is much thirst, with loss of appetite. If gastro-enteric catarrh sets in, this is evidenced by epigastric pain and tenderness, redness of the tongue, nausea and vomiting, and diarrhœa.

Cases differ much in their severity, and not unfrequently serious lung-complications arise, especially capillary bronchitis and pneumonia, which are accompanied by their special signs, and which greatly aggravate the danger, being often attended with the phenomena of apnœa. Pneumonia is apt to come on insidiously, without any prominent symptoms. In these and other cases there is sometimes a tendency to adynamia, the tongue becoming brown and dry. Nervous symptoms are occasionally very prominent, viz.: delirium, stupor, and convulsions.

Diagnosis.—The epidemic nature of this disease, marked fever, with great nervous depression, and catarrhal symptoms, sufficiently characterize it.

Duration and Terminations.—Uncomplicated cases ge erally begin to convalesce from the fifth to the tenth day, but t duration may be much prolonged by complications. The gr majority of cases end in recovery, but convalescence is often v tedious, and various sequelæ are apt to remain, viz., great deb and nervous depression, neuralgic and rheumatic pains, w are common about the head and neck, persistent cough occasionally bronchitis and emphysema, chronic laryngi phthisis is set up. Death is usually the result of lung-con tions, but sometimes occurs from adynamia.

Prognosis.—The circumstances which make influenz

1. *Local.*—These are just what might be anticipated from the physical conditions present in the larynx. The *voice* is at first harsh and hoarse, or at times cracked and shrill, finally becoming whispering or completely lost. Paroxysms of spasmodic, "croupy" *cough* come on, short, sharp, and abrupt in character, dry, of high pitch, and somewhat metallic, clanging, or "brassy" quality. The cough is interrupted by a shrill, ringing, whistling, or "crowing" inspiration. Soon it becomes husky and muffled, and at last loses all sound. *Respiration* is greatly interfered with, and presents some very peculiar characters. The act is exceedingly labored, and attended with violent efforts; it is also prolonged, and therefore not frequent. Inspiration is attended with a high-pitched, metallic, sibilant, or wheezing stridor, which is heard at some distance off.

These symptoms are not persistent, but there are intervals of complete or comparative ease, especially during the day. In severe cases, however, or in the advanced stages of those tending to a fatal issue, there may be scarcely any remissions. The paroxysms of dyspnœa are commonly believed to be partly caused by spasm of the muscles, but Niemeyer argues that these are paralyzed.

The child often grasps its throat, or puts its hands to its mouth, as if to remove some obstruction, and, if old enough, may complain of local pain. A little thick viscid mucus is sometimes brought up by coughing, and in some cases flakes, or larger patches, or even a cast, of exudation, which may be followed by temporary or permanent relief. Dysphagia is sometimes present.

2. *General.*—At first the general symptoms are febrile, and the temperature may rise to 102°—103° or more, the pulse being frequent, full, and hard. Subsequently, however, the pyrexia abates, and in severe cases the prominent signs are those associated with imperfect aeration of blood, which are intensified during the paroxysms. Ultimately in fatal cases gradual or rapid suffocation takes place, attended with the phenomena already described.

Pulmonary complications frequently arise, and increase the gravity of the attack.

Physical Examination.—The throat is seen to be free from any marked morbid changes, there being only some redness and swelling, but some writers describe a croupous deposit here. The *epiglottis* appears very red and turgid. *Laryngoscopy* is scarcely practicable, but if the instrument could be used the deposit might be seen. *Auscultation* over the larynx sometimes reveals a râle, named "tremblotement," heard during inspiration and expiration, and supposed to be due to the flapping of a piece of false membrane. Probably this sound can be produced by thick mucus. *Examination of the chest* shows *more or less obstruction to the entrance of air into the lungs.* The pulmonary sound is also obscured by the loud laryngeal sound. Some mucous râles may be present, and the complications are indicated by their special physical signs.

The *secondary* forms of croup occur during the course of the diseases already mentioned, giving rise to more or less severe symptoms, resembling those met with in primary croup.

COURSE, DURATION, AND TERMINATIONS.—As previously stated, croup usually runs a remittent course, exacerbations recurring during the night. Occasionally it is continuous. Some cases terminate within twenty-four hours, and most end within five days; they may go on, however, for ten days or a fortnight. The *clinical terminations* are in death or recovery. The former generally results from apnœa, but may be due to asthenia. Recovery is indicated by the subsidence of the local and general symptoms, the cough becoming looser, with more abundant muco-purulent expectoration, or a quantity of exudation may be expelled.

DIAGNOSIS.—The diagnosis between throat affections and those associated with the larynx has been pointed out when describing the former. In children, acute laryngeal inflammations, especially croup, have to be distinguished from hooping-cough; catarrh with a tendency to spasm; diphtheria; as well as other affections of the larynx itself, viz., laryngismus stridulus, acute exacerbations in connection with chronic diseases, such as growths, the presence of foreign bodies, or external injury. Only diphtheria and laryngismus can be specially noticed here, but it is important to insist upon carrying out a *thorough physical examination* in all cases. *Diphtheria* involving the larynx may be generally diagnosed from croup by the following characters: 1.

It is either epidemic or there is a history of contagion. 2. There is an account of general illness for some days, with tendency to asthenia. 3. Marked throat symptoms are usually present, preceding the laryngeal symptoms. 4. Enlarged glands exist about the jaws. 5. Epistaxis and albuminuria frequently occur. 6. Laryngeal symptoms are not so urgent. 7. *Examination of the throat* reveals the diphtheritic deposit. There may be some difficulty in connection with *primary laryngeal diphtheria. Laryngismus* is more sudden in the onset, as well as in the cessation of the paroxysms of dyspnœa, and they are often due to some obvious cause. A history of previous similar attacks can generally be obtained. There may be signs of general convulsions, with turning in of the thumbs. The characteristic cough is not present, but the child often cries. There is complete restoration between the paroxysms. Pyrexia is absent.

It is necessary to distinguish croup from other forms of laryngitis. *Catarrhal* is most common in adults, has less severe symptoms, and no croupous cough, but more expectoration; there is less pyrexia; much nasal catarrh is often present. Laryngoscopic examination may afford some aid. The discharge of croupous membrane is a certain indication of croup. *Œdematous laryngitis* is also rare in children, except as the result of drinking boiling water. It almost always follows some previous disease of the larynx. *Expiration is comparatively easy.* Cough is soon completely aphonic, and voice is lost. *The œdematous parts may be seen or felt.*

PROGNOSIS.—All forms of laryngitis are to be regarded as serious. The *œdematous* variety is very grave. *Croup* is a most fatal disease. The prognosis is worse in young infants, and in proportion to the severity and persistence of the local symptoms, and signs of blood-poisoning. Early treatment gives a better chance of recovery.

TREATMENT.—There are certain general matters which it is essential to attend to in the treatment of all the varieties of acute laryngeal inflammation. The patient should remain in a warm room, the temperature being kept uniformly at 65°, or higher, and the air rendered moist by steam. In the case of children it is advisable to make a tent over the bed, as described under diphtheria, and it may be necessary to raise the temperature of the air considerably. All exposure must be avoided, the throat and chest being warmly covered. Rest to the larynx is essential, so far as it can be obtained, and in many cases it is requisite to urge patients to restrain cough as much as possible.

In the case of *adults*, in whom the inflammation is generally of a catarrhal nature, the *assiduous employment* of inhalations of steam is one of the chief things to be attended to, and Dr. Morell-Mackenzie recommends the addition of some tincture of benzoin, hop, or conium juice to the boiling water, or a few drops of chloroform occasionally, if there is much spasm. If the attack results from a cold, it is desirable to excite diaphoresis by warm drinks, a hot or vapor-bath, and external warmth. Hot applications over the front of the neck are useful, such as a sponge dipped in boiling water, and then squeezed dry. Some employ cold applications. If the inflammation is advancing, and especially if it has spread from the throat, it is recommended to apply directly and efficiently a solution of some astringent, either with a brush or sponge, or by an atomizer. Nitrate of silver, alum, tincture of iron, chloride of zinc, and tannin are the substances chiefly employed. In some cases an emetic of sulphate of zinc at the outset is decidedly useful, but the former practice of giving repeated depressing emetics, bleeding, blistering, and administering calomel is most objectionable. Occasionally it might be advisable to apply a few leeches over the upper part of the sternum.

The bowels should be kept freely opened, and a diaphoretic saline mixture given. If there is much unnecessary distressing cough, some sedative may be employed with due precautions, such as a few drops of tinct. camph. co. or liq. morphiæ.

The treatment of children must be similar, whether the inflammation is of a croupous nature or not, and it is necessary to be very prompt in attending to the first indications of anything wrong with the windpipe in such subjects. A warm bath should be employed immediately, and the patient be then dried and wrapped up in blankets, while hot sponges are constantly applied to the throat. The use of *cold compresses* has been advocated, and is certainly deserving of more extended trial. If the symptoms are at all severe, unquestionably great relief often follows the action of an emetic, though Niemeyer states that "they are only indicated where obstructing croup-membranes play a part in producing the dyspnœa, and when the child's efforts at coughing are insufficient to expel them." Tartar emetic and ipecacuanha are preferred by many practitioners, and they may be used in the case of robust children, but sulphate of zinc or copper answers best in weakly subjects.

Bleeding has been extensively practiced in croup, but it should not be had recourse to as a mere routine measure. *Leeches* are often useful in the case of healthy plethoric children at an early period, especially if there are signs of local blood-stasis. They are best applied over the upper piece of the sternum, the number varying according to circumstances. Notwithstanding the high authority by which the regular administration of *calomel* is supported, I have never seen any good result from it in this disease, but have more than once known it to do a great deal of harm, and therefore feel obliged to express my decided objection to its employment. It may be advantageous to give one dose of it as a purgative at the commencement. The bowels should be kept freely open, and for this purpose enemata are best. It is difficult to determine what internal remedies are best in this disease, but it has appeared to me that most benefit is derived at first from salines, with small doses of tartar emetic or ipecacuanha wine. The cough must be rather encouraged than stopped, and therefore sedatives are contraindicated. Later on stimulant expectorants are required, such as ammonia, senega, and squills. Some recommend alkaline carbonates or chlorate of potash.

Counter-irritation is not attended with much benefit, but Dr. Squire considers the application of tincture of iodine to the sides of the neck of some service, especially if covered with water-dressing.

The *dieting* is often of much importance. At first the food should consist chiefly of milk, with cooling drinks, but nourishing soups or meat-juices are required when the system shows any signs of failure. Alcoholic stimulants are not usually needed unless there is some pulmonary complication. If nourishment cannot be taken, it may be necessary to have recourse to nutrient enemata.

The question of *tracheotomy* is often one of the greatest moment. It seems to me that, if the symptoms increase in gravity, notwithstanding the treatment advocated above, and if signs of apnœa set in, the operation ought to be performed without delay, as affording the only chance of recovery, due care being taken both in its performance and in the subsequent treatment.

Complications must be treated as they arise. It is necessary in cases of recovery to exercise great care during convalescence. As *prophylactic* measures in those subject to croup, cold washing of the throat and chest, with dry friction afterwards, proper clothing, and the avoidance of cold damp winds and night air, are the chief things to be attended to.

Secondary croup calls for the administration of stimulants and abundant nutriment. Tincture of steel and mineral acids are the best medicines.

In *œdematous laryngitis* the remedies are rapid emetics, the frequent sucking of fragments of ice, *efficient scarification*, or, in case of need, tracheotomy.

If there are signs of apnœa, the most effectual treatment is to place the patient in a warm bath, and pour a large quantity of cold water over the head and shoulders. Sinapisms to the legs and other parts may be used.

CHRONIC LARYNGITIS.—CHRONIC LARYNGEAL CATARRH.

ETIOLOGY.—The causes of the different forms of this affection are: 1. Acute laryngitis, of which it may be a sequel. 2. Excessive use of the voice, in speaking, shouting, singing, &c. It constitutes the chief morbid condition in "clergyman's sore throat." 3. *Phthisis* and *Syphilis.* 4. Irritation extending from the throat. 5. Some local irritation in the larynx, especially ulcers and growths, and also pressure upon it. 6. Irritation of the recurrent nerve. 7. Habitual inhalation of irritant particles. 8. Chronic alcoholism, and excessive smoking. 9. Occasionally, general plethora, or a peculiar constitutional condition, with a tendency to chronic catarrhs.

Anatomical Characters.—These differ in different cases, according to the duration, seat, and extent of the affection, and the variety it assumes. More or less hyperæmia is generally observed, and the vessels may be evidently enlarged, especially in the form known as "phlebectasis laryngea." The membrane tends to become thickened and firm, as well as the submucous tissue, especially in *phthisis* and *syphilis*, in which diseases all the tissues are much altered in structure. Sometimes there is chronic œdema. The surface is either dry and shining, or presents small lumps of mucus, or abundant secretion. In the "glandular" or "follicular" variety, which is that forming part of "clergyman's sore throat," the morbid changes are chiefly seen in connection with the racemose glands of the larynx, which are enlarged and red. The canal of the air-tube may be much dilated, or, on the other hand, contracted, particularly in phthisis and syphilis, its various parts being in some cases much altered in shape and appearance, and the surface uneven. Erosions and ulcerations are common. Sometimes hemorrhage occurs. In *phthisis*, a chronic œdema of one or both ary-epiglottic folds is often observed, which is pathognomonic. They look like large, pale, solid, pyriform tumors, the large ends being against each other in the middle line, and the small ones directed upwards and outwards.

Symptoms.—In many cases unpleasant and irritating sensations are experienced in the larynx, which are worse after speaking, but they are not usually marked. *Alterations in the voice* constitute the most important, and not uncommonly the only symptom of this disease. It is more or less weakened to complete aphonia; often hoarse and harsh, deep-toned, or cracked. It is subject to variations, and, in the slighter cases, frequently improves if the patient speaks for a time. The changes in the voice may only be noticed during loud speaking. Paroxysms of *spasmodic cough* cause much distress in some cases, but this symptom may be completely absent. Many patients have a short, tickling cough, others hawk frequently, in order to clear away viscid secretion. The cough may be hoarse, cracked, barking, or aphonic, and is sometimes attended with much expectoration. *Breathing* is only disturbed when there is much thickening of tissues, or œdema, leading to narrowing of the larynx, and then there may be considerable dyspnœa, with stridulous inspiration. *Dysphagia* is sometimes experienced.

The *laryngoscope* discloses the exact state of the larynx, and may show that the muscles of the glottis do not act properly. Sometimes mucous râles may be heard with the stethoscope.

There are no *general* symptoms directly due to chronic laryngitis, but the system is often affected, owing to some other local or constitutional affection.

This disease frequently increases the symptoms associated with other organic mischief in the larynx, such as ulceration or morbid growths.

ULCERS OF THE LARYNX.

The forms of ulceration which are met with in the larynx include—1. *Superficial catarrhal.* 2. *Follicular.* These are chiefly associated with chronic laryngitis. 3. *Variolous,* resulting from small-pox pustules. 4. Ulcers connected with *typhus* and *typhoid,* which generally spread extensively and deeply; the latter are believed by many to result from "typhoid deposit." 5. *Phthisical or tubercular.* These do not by any means always originate in tubercle. Usually they commence as minute, circular ulcers, which are often first observed at the back of the ventricular bands, and on the under surface of the epiglottis; by their union they produce large and irregular ulcerations, and they may spread extensively. Sometimes ulceration begins on the vocal cords. Generally it does not produce deep destruction of tissue, but it may do so. The epiglottis is often eroded at its margins, and the cartilage may be exposed or perforated. Calcification and necrosis of the cartilages not unfrequently follow phthisical ulceration. 6. *Syphilitic.* Occasionally *secondary* ulcers are met with in syphilis, which are limited, superficial, and may occur in any part. *Tertiary* ulcers exhibit a special tendency to begin on the epiglottis; they spread rapidly, both in extent and depth, causing great destruction of tissues, and presenting irregular ragged edges. In some cases the ulceration spreads from the throat; it may originate in the breaking-down of "gummata." It is sometimes extending at one part, while cicatrizing at another. The scars have a great tendency to contract, and narrow the calibre of the larynx, or cause adhesion and distortion of structures. 7. *Cancerous.* These are very rare.

Symptoms.—In the slighter cases there are often no special symptoms, and also in those ulcerations which are associated with the acute fevers.

Painful sensations may be felt in the larynx, of a burning, smarting, or pricking character, increased by coughing or speaking, with tenderness on pressure. *Deglutition* is difficult or painful, if the epiglottis is involved, especially as regards liquids. The *voice* is often altered in quality, harsh, hoarse, or cracked and weak. Suffocating fits of *cough* are common, and pus, blood, or laryngeal tissues may be expectorated. *Breathing* is frequently noisy, and of laryngeal characters, and there may be urgent dyspnœa. The throat is often affected at the same time. Cicatrization of an ulcer may give rise to signs of permanent stricture.

Morbid Growths in the Larynx.

The abnormal growths and tumors which may be found in the larynx are either *malignant* or *non-malignant.* The *malignant* include: 1. *Epithelial.* 2. *Encephaloid.* 3. *Scirrhus.* All are very rare, epithelial being most common, and they usually result from extension. The *non-malignant* comprise: 1. Syphilitic condylomata and mucous tubercles. 2. *Papillomata.* 3. *Mucous polypi* or *fibro-cellular tumors,* either pedunculated or not. 4. *Fibrous tumors or polypi.* 5. Cystic growths. 6. Lipomata. 7. Erectile vascular tumors. 8. Enchondromata. 9. Hydatids. Those last mentioned are extremely exceptional.

Symptoms.—The size, situation, number, and nature of morbid growths, as well as the size of the larynx, will necessarily influence the local symptoms. Rarely is there any pain, but occasionally a feeling of a foreign body is experienced, or a sense of obstruction or uneasiness. Dysphagia is sometimes present. The *voice* is often partially or completely lost, and altered in quality, and *it is liable to sudden changes.* More or less *dyspnœa* is usually felt, and the breathing may be stridulous; this symptom is also *subject to rapid variations,* and frequent suffocative attacks may come on, which are due to spasm. When the growth is *above the glottis,* *expiration is often quite free.* The removal of part of a growth may induce greater dyspnœa, in consequence of its position being disturbed. *Cough* is present in many cases, varying in its characters, and it is not unfrequently voluntarily excited, with the view of getting rid of the obstruction. In the expectoration, which is usually increased and altered, *fragments of the growth are sometimes expelled*, but Dr. Morell-Mackenzie states that the microscopic examination of these cannot be relied upon for differential diagnosis. *Laryngoscopic examination* reveals the nature and seat of any growth. Sometimes it extends through the opening of the larynx, so as to be visible on *inspection of the throat.* A characteristic *valvular murmur* has been described as being heard over the larynx, but this is not reliable. *Examination of the chest* often reveals obstruction to the entrance of air into the lungs.

The mere interference with the function of respiration may considerably affect the general system, and if the growth is cancerous, the usual cachexia is often present.

Laryngeal Perichondritis. Abscess. Necrosis of the Cartilages.

These rare morbid conditions may be considered together, and only call for a few observations. In *perichondritis* an exudation is said to exist between the perichondrium and cartilages, especially the cricoid, and afterwards pus forms, while the cartilages necrose, and are finally discharged in fragments. The irritation may lead to abscesses in the parts around.

Usually these changes are associated with ulceration; necrosis of the cartilages is by far most frequent in phthisis. Syphilis, abuse of mercury, low fevers, cold, &c., have been set down as very rare causes.

The *symptoms* are considerable limited pain, extremely irritable cough, great alterations in voice, usually severe dyspnœa, followed by expectoration of fragments of cartilage, signs of abscesses, &c.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC ORGANIC LARYNGEAL DISEASES.

DIAGNOSIS.—In endeavoring to arrive at a diagnosis with regard to any chronic laryngeal affection, it is necessary to determine whether any organic mischief exists, and, if so, what is its exact nature, seat, and extent. The chief points to be taken into consideration are: 1. The personal and family history of the patient as indicating any constitutional diathesis. 2. The existing evidence of constitutional disease, especially *phthisis*, *syphilis*, or *cancer*. 3. The exact local symptoms present, particularly as regards *breathing* and *voice*. 4. If there are signs of disease in the lungs, especially on *careful physical examination*, or if this reveals any morbid condition which might affect the nerves of the larynx. 5. The results of *laryngoscopic examination*. Of course it is by the employment of this instrument in a satisfactory manner that positive and accurate information can alone be obtained.

PROGNOSIS.—All organic laryngeal affections are troublesome, and some of them very dangerous, especially where there is extensive ulceration, great thickening of tissues, destruction of the cartilages, or when certain morbid growths exist, or such as cannot be removed. The danger is in proportion to the degree of interference with breathing, and the liability to spasm. In many cases there is no fear of a fatal result, but the prognosis as regards restoring the functions of the larynx is unfavorable. Much will depend on the constitutional condition. Syphilitic disease may often be rapidly cured under proper treatment. Laryngeal phthisis is very serious and intractable as a rule. Cancer is necessarily fatal.

TREATMENT.—Rest to the larynx as far as possible; a *dry* atmosphere, of warm and uniform temperature; the removal of all causes of local irritation; the stoppage of any injurious habit, such as excessive smoking; and the wearing of sufficient warm clothing over the neck and chest, are the principal general matters to attend to. In some cases a change of climate is imperative, if it can be obtained, but if not, a respirator should be worn, and damp, cold, and especially night air be avoided.

Constitutional treatment is often of great importance, especially in the case of syphilitic and phthisical affections. In many instances of chronic laryngitis tonics are useful, or treatment directed to the alimentary canal. Various German waters, and those of the Pyrenees, are recommended in obstinate cases. Sometimes deglutition is much affected, owing to the condition of the epiglottis, especially in phthisis, and then particular attention is required as regards the feeding of the patient, care being taken that a sufficient quantity of nutriment is consumed. It is useful in these cases to thicken liquids with corn flour or arrowroot. Sometimes the food must be administered through an œsophageal tube, or by enema.

Local treatment is, however, as a rule, that requiring the chief attention. The best modes of applying remedies are by a camel's-hair brush attached to a bent handle, by inhalation, by the spray-inhaler, or by blowing in powders. Lozenges are very useful if the throat is affected at the same time. The applications should be made effectually, regularly, and as frequently as the case may require, the laryngoscope mirror being employed to give light. The chief substances employed are—1. *Mineral astringents* and *caustics*, viz., nitrate of silver, chloride, sulphate, or acetate of zinc, alum and chloride of aluminium, perchloride of iron, sulphate of copper. 2. *Vegetable astringents*, viz., *tannin*, kino, &c. 3. *Volatile stimulating substances in inhalations*, viz., creasote, carbolic acid, oil of pine or juniper. 4. *Sedatives in inhalations*, viz., conium, tincture of benzoin, chloroform. Glycerin is the best solvent when any substance is applied with the brush. Different remedies are required in different cases, but Dr. Morell-Mackenzie finds *chloride of zinc* one of the most useful mineral astringents in chronic laryngitis. *Tannin* is very valuable in *phthisis*, and *nitrate of silver* in *syphilitic ulceration.*

As regards *growths*, these necessarily require *removal by operation* as a rule. Evulsion is the chief method, but it is needless to enter into any description on this subject, as only those who have had considerable practical experience would be likely to perform the operation. Even cancer may sometimes be taken away, with temporary benefit. Caustic remedies are of no value, except for the destruction of condylomata. The galvanic cautery has been employed.

Not uncommonly *tracheotomy* is called for, on account of extensive ulceration, morbid growths, or great thickening and contraction, in order to prevent suffocation. Two very satisfactory cases of this kind have recently been under my care. Subsequently a growth may be removed by dividing the thyroid cartilage.

In all cases where there is liability to laryngeal disease, every precaution must be taken to guard against it. In *phthisis* the least indication of any laryngeal irritation should lead to prompt treatment.

ŒDEMA GLOTTIDIS.

ETIOLOGY.—The loose submucous tissue which is present in some parts of the larynx is very liable to become the seat of œdema, and this may arise under the following circumstances: 1. In connection with acute laryngitis, especially that due to local irritation. 2. From the irritation due to chronic laryngeal diseases, *e. g.*, ulcers, growths, necrosis of cartilages. 3. As a complication of some of the acute specific fevers, viz., small-pox, *scarlatina*, *erysipelas*, typhus, and typhoid. 4. By extension of inflammation from the throat. 5. Occasionally it may be associated with renal disease, being part of a general dropsy, and possibly with cardiac or venous obstruction.

The *symptoms*, *diagnosis*, and *treatment*, have already been considered under *Œdematous Laryngitis*, what has been stated there applying to all forms of œdema.

FUNCTIONAL OR NERVOUS AFFECTIONS OF THE LARYNX.

Hyperæsthesia, with irritable cough, *neuralgia*, or more or less *diminution in sensibility*, is now and then observed in connection with the larynx; but the most important functional disturbances which call for notice here are those associated with *spasm* or *paralysis of the muscles.*

LARYNGISMUS STRIDULUS—SPASM OF THE GLOTTIS—SPASMODIC CROUP—SPURIOUS CROUP, &c.

ETIOLOGY.—The proximate cause of the spasmodic action in connection with the glottis-closers is some irritation conveyed by the laryngeal nerves. This may be: 1. *Centric*, originating in the brain, either from some organic mischief, *e.g.*, hydrocephalus, or disturbance of its circulation or nutrition. 2. *Direct*, from irritation of the vagus or recurrent nerves by enlarged glands, tumors, &c. Formerly the disease in children was called "thymic asthma," being supposed to be due to pressure of an enlarged thymus gland. 3. *Reflex*. The reflex irritation may arise in the larynx itself, or from dentition, improper feeding, *especially in the case of infants brought up by hand or nursed by unhealthy mothers*, worms, a cold draught on the skin, and various other sources.

This complaint is rarely met with except in children, especially during the first and second years. In adults it is only observed in hysteria, or from pressure on the nerves, or in connection with the irritation of foreign bodies or gases. It is most frequent among males, and those living in the crowded parts of large towns and cities, especially if brought up by hand and under improper hygienic conditions. Scrofulous children are said to be more subject, and this is undoubtedly true as regards rickets. *It* has been suggested, that in the latter disease the laryngismus *is* due to pressure upon the brain when the child lies on its back, owing to the thinness of the occipital bone.

There may be some obvious *exciting cause* of an attack or not. Thus it sometimes comes on during swallowing, from tossing up the child in the air, or from severe mental emotion, especially fright or anger.

SYMPTOMS.—In children the attack in most cases comes on at night, during sleep, and is very sudden. *The symptom* is dyspnœa, more or less intense, with, usually, stridulous, crowing inspiration, but the glottis may be for a moment completely closed, so that no air enters, and respiration ceases entirely. The child struggles for breath, and presents, to a greater or less degree, the appearances due to apnœa. Often there are general convulsions, with "carpo-pedal" contractions, strabismus, and sometimes involuntary discharge of fæces and urine. The attack subsides suddenly or very rapidly, and the child frequently cries. The restoration is complete, and there is no affection of the voice or cough. Pyrexia is usually absent.

An essential character of this affection is the great tendency to the recurrence of the attacks. They vary in frequency, duration, and severity, but tend to become more frequent, longer, and more intense as the case progresses. Ultimately death not unfrequently occurs in one of them from suffocation.

The spasmodic affections in adults do not call for particular remark. *Hysterical cough* is believed to be sometimes due to a spasmodic tendency in the adductors of the cords during expiration; and the sharp ringing cough which occasionally affects children is supposed to have the same cause, the spasm being reflex (Morell-Mackenzie).

DIAGNOSIS.—The only disease likely to be mistaken for laryngismus is croup, and their diagnosis has already been pointed out.

PROGNOSIS.—Most reflex cases recover, but those due to other causes are very serious. Much will depend upon the state of health of the child, and the severity and frequency of the fits.

TREATMENT.—During the paroxysm measures must be immediately adopted for the relief of the spasm. Slapping or rubbing the back, shaking, dashing cold water in the face, fanning, tickling the throat so as to excite vomiting, a warm bath alone or with cold douching while in it, and holding ammonia to the nostrils, are the chief things recommended. A rapid emetic is useful, if it can be taken, or, if the attack persists, enemata of asafœtida or valerian may be used, and sinapisms applied to the chest. Exciting artificial respiration is sometimes serviceable. At the same time it is most essential *to look for any source of reflex irritation, and remove this;* for instance, lancing the gums often gives speedy relief. In prolonged cases, inhalation of chloroform may be carefully tried, and sometimes it is necessary to have recourse to tracheotomy, which may be performed even after apparent death.

During the intervals it is important to look to the diet, to the state of the alimentary canal, and to the general health, and improve these, if required. Tonics, change of air, and salt-water bathing, often do much good.

In adults, the main objects are to remove the cause of any spasm, and to use sedative inhalations.

LARYNGEAL PARALYSIS. PARALYSIS OF THE MUSCLES OF THE VOCAL CORDS.

ETIOLOGY.—Paralysis in connection with the larynx may occur: 1. As the result of some local organic mischief, past or present. 2. From pressure on or traction of the pneumogastric or recurrent nerves, one or both, by tumors, enlarged glands, &c. 3. After *diphtheria*, and rarely after typhus or intermittent fever. 4. *As a part of hysteria*, especially if there is much debility. 5. From chronic poisoning by lead or arsenic. 6. Very rarely from centric disease in the brain or upper portion of the cord. 7. As the consequence of atrophy and degeneration of the muscles.

VARIETIES AND THEIR SIGNS.—Four chief varieties are described, viz.: *Bilateral* and *unilateral paralysis of the adductors* or *glottis-closers*, and *abductors* or *glottis-openers*. Rarely a single muscle may be affected.

1. *Bilateral paralysis of adductors* — *Hysterical* or *functional aphonia*. *Voice* is lost, but cough is usually attended with sound. The patient sometimes speaks in a scarcely audible whisper. The *laryngoscope* shows *that the vocal cords remain apart, either partially or entirely, during attempted phonation, and they may be perfectly motionless.*

2. *Unilateral paralysis of adductors*. *Voice* is altered, and there may be a permanent falsetto. The sound produced during coughing, sneezing, or laughing, is usually much changed and weakened. The *laryngoscope* reveals that *one cord does not act when the patient attempts to speak or cough*, and that it is generally congested. This form is usually due to some direct cause, acting on the nerve.

3. *Bilateral Paralysis of Abductors.* — Here the prominent symptom is *dyspnœa*, with noisy, stridulous inspiration, always present more or less, but subject to severe exacerbations, especially after exertion, or on making a deep inspiration. Voice is not much affected, but may be harsh. *Laryngoscopy* discloses *that the cords lie close together*, *near the median line*, and *do not separate when an inspiration is made*. Some consider this to be the pathological condition in laryngismus, and not spasm.

4. *Unilateral paralysis of the abductors* is attended with some

dyspnœa and noisy breathing, and the affected cord does not move during breathing, but remains near the median line.

In some cases both sets of muscles are involved, and then there is a combination of the symptoms and signs, as is usually observed from pressure on the recurrent nerves. When one muscle only is paralyzed, the voice may merely be somewhat altered, being mono-toned, or some notes not being capable of production.

DIAGNOSIS.—The history of the case; the general condition of the patient (*e.g.*, hysterical); the detection of some obvious cause; and the symptoms, with the results of laryngoscopic examination, will usually enable these affections to be distinguished from organic diseases.

PROGNOSIS.—Paralysis of the adductors is favorable as a rule; of the abductors very unfavorable, the patient being in great danger. The cause of the paralysis will necessarily influence the prognosis.

TREATMENT.—General treatment is often indicated. All obvious causes of irritation must be removed, if possible. *Local Faradization* is the great remedy in *paralysis of the adductors*, one pole being placed over the thyroid or cricoid cartilage, and the other in contact with the vocal cords. *Paralysis of the abductors* usually requires tracheotomy to avert suffocation.

CHAPTER IX.

DISEASES OF THE LUNGS AND PLEURÆ.

CLINICAL CHARACTERS.—It is unnecessary to do more than enumerate the symptoms associated with lung diseases here, as they have already been alluded to, and they differ so much in their characters in different affections, that no uniform description of them can be given. Those which are to be looked into include: 1. *Pain in the chest*, which must be investigated in all the points mentioned when speaking of pain in general, *particularly noticing the effect of cough and deep inspiration upon it.* 2. *Disturbance of breathing.* 3. *Cough.* 4. *Expectoration.* 5. *Hæmoptysis.* 6. *Changes in the expired air.*

With regard to the "physical signs," only those will be set down in the subsequent pages which are *positively* useful in the diagnosis of the disease under consideration, and they will not be described in any detail, as this has already been done in the chapter on "Physical Examination." It is only necessary to add further, that, in order to understand the significance of the "physical signs" in each disease, it is requisite to bear in mind the physical conditions present, as described under "anatomical characters."

ACUTE BRONCHIAL CATARRH. ACUTE CATARRHAL BRONCHITIS.

ETIOLOGY.—*Predisposing Causes.* These are: Early or advanced age; indulgence in relaxing and enervating habits, and immoderate clothing of children; debility from any cause; the presence of constitutional disease, *e. g.*, rickets, tuberculosis, gout, &c.; chronic pulmonary affections, or previous attacks of bronchitis; cardiac affections, or other conditions which induce overloading of the bronchial vessels; a cold and damp climate or season, especially when there are sudden changes of temperature; occupations involving exposure, rapid changes in temperature, or the breathing of irritating particles; and residence in the poorer, and unhealthy districts of large towns.

Exciting Causes.—1. In the great majority of cases, bronchitis results from "taking cold" in some way or other, such as by exposure to cold and wet, sitting in a draught when perspiring, sudden changes in temperature, wearing damp clothes, sleeping in damp beds, wearing insufficient clothing, &c. There can be no doubt that many children suffer in consequence of the legs and lower parts of the body being so often unprotected. 2. *Direct irritation of the bronchial mucous membrane* is another frequent cause, by very hot or cold air, irritant gases, mechanical particles in the inspired air, *e. g.*, cotton, wool, dust, steel, &c., blood, irritating secretions, or morbid growths, *e. g.*, tubercle and cancer. 3. *Blood-poisoning* may induce bronchial catarrh, in various fevers, especially typhoid and measles; in gout, rheumatism, syphilis, &c.; after the sudden disappearance of acute or chronic skin affections, or the suppression of discharges, or during the administration of certain medicines, especially iodine. 4. Bronchitis occurs *epidemically*, associated with influenza.

ANATOMICAL CHARACTERS.—The morbid appearances directly indicating bronchial catarrh, are similar to those already described as belonging to catarrhs in general, viz., redness varying in its hue and arrangement; swelling, opacity, relaxation, and loss of consistence of the membrane, which is at first dry, but soon forms excessive secretion, changing in its characters as the case progresses, being at first clear, frothy mucus, and then becoming more opaque and viscid, muco-purulent, or purulent, from the abundance of cells; often epithelial abrasions, or even slight ulcerations. Occasionally blood is present in the tubes, or fibrinous particles or casts.

The appearances will necessarily vary considerably, according to the extent, severity, and stage of the disease. The redness is most marked towards the upper part of the lungs, and at the bifurcations of the bronchi, but is rarely perceptible beyond the fourth or fifth division of the bronchi, and it may disappear after death, owing to the action of the muscular and elastic fibres. The inflammatory products are most abundant towards the bases, and in the dependent parts of the lungs; by their accumulation in the air-cells and minute bronchi, they sometimes give rise to yellow spots near the surface, especially in children. Both lungs are usually affected, but to an unequal degree.

As complications associated with the bronchitis, the chief conditions observed are, pulmonary congestion and œdema; *lobular*, or more extensive *collapse; acute emphysema or insufflation; lobular*, or rarely lobar pneumonia, and pleurisy. The venous portion of the circulation is overloaded with dark blood. The bronchial glands are often red, soft, and enlarged.

SYMPTOMS.—It will be necessary to allude to certain variations presented in the symptoms of acute bronchitis, due to several causes, but, in a general way, they may be summed up as: unpleasant or painful sensations in the chest; more or less interference with breathing; cough, with expectoration of the materials formed in the tubes. A variable degree of pyrexia is almost always present, and in some cases there is a tendency to suffocation, from blocking up of the bronchial tubes, in others to adynamia.

I. PRIMARY OR IDIOPATHIC BRONCHITIS.—1. *Involving only the larger and medium-sized tubes.* When due to "a cold," the complaint is usually ushered in by coryza, sore throat, and some hoarseness, with chilliness, or slight shiverings, alternating with a sense of heat, general pains, languor, drowsiness with restlessness, furred tongue, anorexia, and constipation. Occasionally slight delirium is present, or, in very young and weakly children, convulsions may occur.

The disease, when established, presents *local* and *general* symptoms.

Local.—Subjective sensations of heat, burning, rawness, soreness, tickling, or actual pain, are experienced to a greater or less degree over the front of the chest, but especially behind the upper part of the sternum, and in the notch above. These are increased by a full inspiration, and a cough often gives rise to much tearing pain. There may be tenderness over the sternum. Muscular pains are common, as the result of cough, especially towards the sides and base of the chest. A feeling of oppression, weight, or tightness in the chest exists, and respiration may be somewhat hurried and laborious, but there is no evident dyspnœa. *Cough* is a prominent symptom, being due at first to the irritable condition of the membrane, and subsequently to the secretions in the tubes. It is paroxysmal, often irrepressible and violent, especially on lying down, and waking up in the morning. *Expectoration* soon occurs, the sputa consisting at first of a little clear, thin, frothy mucus, but afterwards increasing in quantity, and becoming muco-purulent, more or less opaque, viscid, and scarcely aerated. Sometimes they are very tenacious and adhesive, or ropy, and may form distinct "nummulated" masses. As they alter in characters, they are more easily expelled. They may be streaked with blood. Under the microscope epithelial cells, numerous young cells, exudation- and pus-corpuscles are the chief elements observed, with abundant granular and molecular matter, and sometimes a few blood-disks, fibrinous coagula, or crystals.

General.—If the bronchitis is at all extensive, a certain degree of fever is present, but it is never very marked. There is frequently a considerable sense of languor and weakness. Catarrh of other mucous surfaces often exists at the same time.

2. *Capillary bronchitis, extending into the minute-tubes.*—In most cases this form is but an extension of that already described, being preceded by its symptoms, but sometimes the smaller tubes seem

to be affected at the same time as the larger, or independently, and then well-marked rigors may occur at the outset, with headache and vomiting. The peculiar features of capillary bronchitis are as follows: 1. Pain is often slight or absent, except the muscular pains resulting from cough, which are very severe. 2. *Respiration is always greatly disturbed*, being accelerated, sometimes to 50 or more per minute, wheezing or crepitous, attended with effort, and there being a considerable sense of want of air. The pulse-respiration ratio is altered, and may be 2.5 to 1. Urgent dyspnœa is observed in severe cases, either constant or paroxysmal, which may amount to orthopnœa. 3. *Cough is exceedingly frequent and violent*, and, during the act, patients often sit up or bend forward, and hold their sides. 4. *Expectoration is very difficult*, the sputa being usually viscid and tenacious, abundant, and containing minute fibrinous casts of the tubes. 5. The *general symptoms* are of an aggravated character, there being at first considerable fever, the temperature occasionally rising to 103° or more, with much exhaustion and weakness. The urine sometimes contains a little albumen or a trace of sugar. As the case advances, the tendency is *to the occurrence of the usual symptoms indicating suffocation and venous congestion*, usually gradual in their onset, occasionally rapid or sudden, owing to the filling up of the tubes, the cough diminishing, the breathing becoming shallow, and the expired air cool. In some instances, however, *adynamic* symptoms set in, or there may be a combination of both.

It is necessary to allude to some peculiarities due to individuals. *Children* are very prone to show signs of deficient blood-aeration, even in the slighter cases, especially if they are feeble and badly nourished or rickety, because they cannot expel the sputa. They usually swallow these, and therefore, in order to examine them, it is necessary to wipe the base of the tongue with a handkerchief after a cough. *Healthy adults* do not suffer nearly so severely as a rule. In *aged persons*, or those who are *constitutionally weak* from any cause, the fever is very apt to take on *an adynamic type*, even though the bronchitis is not extensive. The term "peripneumonia notha," formerly much employed, properly includes cases of capillary bronchitis occurring in old or weak subjects after some chronic malady, with febrile symptoms at first, but signs of adynamia and deficient aeration of blood setting in early.

II. Secondary Bronchitis.—This term is applied to the disease occurring in connection with the *exanthemata; blood diseases, e. g.*, gout, rheumatism, Bright's disease, &c.; or *chronic lung or heart affections.* In nearly all these conditions it is apt to *come on very insidiously, without any of the usual symptoms being prominent*, and is often a dangerous complication. It is said that the sputa sometimes contain peculiar materials which accumulate in the blood, *e. g.*, uric acid in gout. Lung-deposits usually produce localized bronchitis. If there is emphysema and chronic catarrh, especially with cardiac disease, urgent dyspnœa and signs of apnœa are likely to set in speedily, with venous congestion and dropsy; expectoration is also very abundant and frothy at first.

III. Mechanical Bronchitis.—When due to the inhalation of irritant particles, the attacks of bronchitis are frequent, but slight, there being no pain or fever, an irritable cough, with but little expectoration, which may contain some of the particles breathed. "Hay-asthma" is a variety which will be hereafter alluded to.

IV. Epidemic Bronchitis has been already described in connection with influenza.

It must be remembered that the complications previously mentioned may be present and modify the symptoms, as well as the "physical signs," which are now to be considered.

Physical Signs.—1. The chest may be somewhat enlarged, from distension of the lungs. 2. *Respiratory Movements* are more or less quick, frequent, and deep, expiration is sometimes prolonged, and if the tubes are extensively filled the upper part of the chest moves in excess. *In children signs of inspiratory dyspnœa are very common.* 3. *Rhonchal fremitus* is frequently present, varying in its characters. 4. *Percussion* may reveal *increase in extent and degree of pulmonary resonance* from distension; or occasionally some deficiency of resonance at the bases is observed, due to accumulation of secretion, congestion and œdema, collapse, &c. In infants a sound resembling the "bruit de pot fele" may be produced often. 5. *Respiratory sounds* are loud and harsh, with prolonged expiration, where the tubes are free; where obstructed they are weak or absent, or they may be completely obscured by rhonchi. 6. The *various rhonchi*, due to the narrowing of the tubes or to the fluids in them, constitute *the important physical sign* in bronchitis. *Sonorous, sibilant, mucous, submucous*, and *subcrepitant*, are those met with, according to the physical conditions present, and they often exist together in different parts of the chest. At first the "dry râles" are only, or chiefly, heard, and the "moist" are principally observed towards the bases of the lungs. When fluids collect in the larger tubes "rhonchal sounds" may be audible at a distance from the patient. Cough affects them considerably. Occasionally the heart's action may cause râles.

DURATION AND TERMINATIONS.—According to its severity, a case may end in three or four days, or go on for two or three weeks or more. *Capillary bronchitis* generally proves fatal from the sixth to the twelfth day, death being earlier in children than adults, as a rule. A relapse, or extension of the inflammation may occur. The *terminations* are: *a.* In *recovery*, but in severe cases convalescence may be very prolonged, and cough is liable to remain for some time. *b.* In *death*, either from gradual or sudden apnœa, or adynamia. *c.* Occasionally by *transition into the chronic state.* As *sequelæ*, emphysema, collapse, deformed thorax in children, or acute or chronic phthisis may remain.

DIAGNOSIS.—The chief diseases from which acute bronchitis requires to be distinguished are—hooping-cough; croup and other forms of laryngitis; pneumonia, especially lobular; and acute phthisis. The diagnosis of the acute diseases of the lungs will be hereafter considered together. It is of importance to recognize any *complications occurring during the course of an attack;* and also not to mistake bronchitis, associated with one of the exanthemata, for the sole complaint.

PROGNOSIS.—Bronchitis is a very dangerous disease, and stands high as a cause of death in this country. The circumstances which increase its gravity are: Very early or advanced age; a bad state of health, or the existence of some general chronic or acute disease; previous organic mischief in the lungs, *especially extensive emphysema*, or heart; *extensive implication of the smaller* *tubes, with great difficulty of expectoration; signs of accumulation in the tubes, with shallow breathing and cessation of cough, or of obstruction (the latter being especially looked for in children)*; urgent dyspnœa, with evidences of apnœa; the presence of adynamic symptoms; the occurrence of complications; neglect of treatment; and a low epidemic type.

TREATMENT.—Early attention is required in all cases of bronchitis, but especially when children are affected. Confinement to the house, or even to one room, is advisable, and, if the case is at all severe, the patient should remain in bed, warmly clad in flannel, avoiding exposure of the chest, the room being kept at a temperature of from 65° to 68°, and it may be necessary to moisten the air with steam. When the attack results from a cold, it is useful at the outset to induce free perspiration by means of copious hot drinks, a warm foot-bath, which may contain a little mustard, or even a hot-air, vapor, or Turkish bath, the patient then going to bed, and lying between blankets, covered with abundant bedclothes. A full dose of Dover's powder may be given, or a saline diaphoretic draught. A sinapism over the chest is useful, and, if the larynx is at all involved, steam inhalations should be employed. An emetic at the outset is in much favor with some practitioners, in severe cases, and might occasionally be serviceable in the case of children.

Should the complaint not subside, the indications are: 1. To subdue the inflammation as soon as possible. 2. To promote the discharge of the materials forming in the tubes, and diminish their quantity, if excessive. 3. To relieve unnecessary cough. 4. To allay spasm of the bronchial tubes, if present. 5. To pay attention to the constitutional condition, and support the strength if it fails. 6. To treat apnœa, excessive fever, or adynamia, should either set in. 7. To attend to complications.

For fulfilling the first indication, general or local bleeding, tartar emetic, tincture of digitalis, aconite, and calomel with opium are the chief remedies recommended. *Venesection* is very rarely required or admissible, but moderate *local bleeding*, by leeches or cupping, may be beneficial *occasionally*, though much discrimination is necessary in adopting this measure. The front of the chest, and the base posteriorly, are the sites from which the blood may best be taken. The application of two or three leeches sometimes relieves severe dyspnœa in plethoric children very satisfactorily.

Tartar emetic is decidedly valuable in the early stage of severe cases, provided the patient is strong, and not too old. It may be given with liq. ammon. acet., and a few drops of tinct. camph. co., in doses of $\frac{1}{4}$th to $\frac{1}{2}$ gr. for an adult. I have no experience as to the use of digitalis or aconite, but they have been well spoken of, and are deserving of trial. I cannot conceive of any case requiring calomel.

The next three indications are carried out mainly by the administration, in various combinations as they are required, of: *Expectorants*, at first vin. ipecac., tinct., v. acet. scillæ, tinct. camph. co., and, later on, carbonate of ammonia, chloride of ammonium, infusion of senega or serpentary, ammoniacum, galbanum, or tincture of benzoin; *sedatives and narcotics*, especially opium or morphia, henbane, conium, hydrocyanic acid, or chlorodyne; and *antispasmodics*, such as ether, tincture of lobelia, or spirits of chloroform. It is necessary to study each case, and vary the remedies accordingly. They may be combined with demulcents or diaphoretics. Should the tubes be much loaded, and expectoration be difficult, narcotics, particularly opium, must be avoided, and the patient should lie with the head high, and be made to cough frequently, not being allowed to sleep for too long a time. It is especially necessary to attend to these matters in children. Should there be dangerous accumulation, an emetic of sulphate of zinc is very useful. On the other hand, if there is an irritable cough, it may often be voluntarily repressed by the patient, and sedatives are then most valuable. *Inhalations* are frequently beneficial, those of conium, ether, chloroform, hop, or benzoin, to relieve cough and check spasm; later on those of tar, creasote, or carbolic acid, to diminish or improve the sputa.

Local treatment is generally called for. Repeated sinapisms, hot or turpentine fomentations, or linseed-meal poultices, are beneficial at first; and when the acute symptoms have subsided, blisters may be useful; or, if there is a tendency to chronic catarrh, some more powerful application may be required, croton-oil liniment being the best. Free dry cupping frequently relieves great dyspnœa and oppression about the chest, especially *when acute bronchitis complicates emphysema with chronic catarrh.* In these cases, also, flying blisters and turpentine stupes are useful.

The *constitutional conditions* chiefly requiring attention are debility, rickets, tuberculosis, and gout. Lowering treatment is not borne when either of these is present. It is quite needless to keep patients on too low a diet, and considerable support is often called for in bad cases. Stimulants are not requisite as a rule, and may do harm, but they must be given if necessary, particularly if there are signs of adynamia or apnœa, their effects being watched.

Excessive pyrexia calls for full doses of quinine. Sinapisms, a warm bath with cold affusion while in it, artificial respiration, and galvanism along the vagus nerves, are the most powerful means we possess of combating asphyxia.

For children, as a rule, one of the best remedies is ipecacuanha wine in moderate doses every three or four hours. When bronchitis occurs in old people, in those who are weak from any cause, or as a secondary complication, wine or brandy and abundant nourishment are usually required, and a mixture should be given containing carbonate or muriate of ammonia, with ether or spirits of chloroform, tincture of squills, and camphor mixture, decoction of bark, infusion of senega, or ammoniacum mixture. *Capillary bronchitis*, in the majority of cases, demands a stimulant and supporting treatment.

Proper precautions must be taken until convalescence is complete, especially against cold and damp, and night air; flannel must be worn next the skin. Tonics are often useful, such as quinine, mineral acids, or iron. Due care must also be exercised in the case of those who are subject to bronchitis, and, for such, a change to some genial climate during the winter season is very desirable.

CHRONIC BRONCHITIS—CHRONIC BRONCHIAL CATARRH.

ETIOLOGY.—As a rule, chronic bronchitis follows repeated attacks of acute, but occasionally remains after one attack, or begins as a chronic affection. It is frequently associated with gout and other constitutional complaints, chronic lung diseases, heart affections causing pulmonary congestion, chronic alcoholism, or is due to the breathing of irritant particles. Persons advanced in years are far most subject, but even children may suffer.

ANATOMICAL CHARACTERS.—When this complaint has been long established, it leads to considerable changes in the tubes. The membranes become dark-colored, often of a venous hue, or here and there grayish or brownish, and the capillaries are visibly enlarged and varicose. Thickening of tissues, increased firmness, which may amount to much induration, and contraction are observed, with loss of elasticity, and muscular hypertrophy. The cartilages may calcify. The small tubes are narrowed or closed up, the larger often dilated, and they gape on section. The surface of the membrane is uneven, often presenting extensive epithelial abrasions, or, occasionally, follicular ulcers. In some cases there is only a little tenacious mucus in the tubes, but usually they contain abundant muco-purulent or purulent matter, or frothy mucus.

SYMPTOMS.—Numerous varieties are presented in practice, as regards the severity and exact characters of the symptoms of chronic bronchial catarrh, depending upon its extent, and upon its frequent association with other morbid conditions in the lungs (especially emphysema or dilated bronchi and phthisis), or heart, or with some constitutional diathesis, but the cases may be classed under three groups:

1. In many instances patients only suffer during the cold season, having a "winter-cough," but after a while the complaint becomes permanent to a greater or less degree, being liable to exacerbations, however, in cold and damp weather. A little uneasiness or soreness is often felt behind the sternum, increased by coughing, but there may be none at all. A sense of oppression about the chest, with shortness of breath on exertion, is usually present in severe cases. *Cough* is the main symptom, occurring chiefly in paroxysms, varying greatly in severity and frequency; it is often very annoying on first going to bed, and early in the morning. It is attended with *expectoration*, the sputa being frequently difficult to expel, and abundant, consisting of grayish mucus, yellowish or greenish muco-purulent or purulent matter, or a mixture of these, usually running into one mass, but occasionally remaining

in separate lumps, which may be "nummulated." Being but slightly aerated, the masses not unfrequently sink in water. Occasionally blood-streaks are observed. Sometimes a most offensive or gangrenous odor is given off, supposed to be due to decomposition, or to microscopic sloughs. The microscope reveals much granular matter, with imperfect epithelial and pus-cells, and often blood-corpuscles.

In bad cases, considerable wasting and debility may be observed, with slight evening pyrexia and night sweats.

2. *Dry Catarrh; Dry Bronchial Irritation.*—This is particularly observed in connection with gout, emphysema, irritant inhalations, and in seaside places. More or less dyspnœa, with tightness in the chest, is felt, and very severe, distressing paroxysms of irritable cough come on, either *quite dry*, or only followed by the expectoration of a small pellet of grayish, pearl-like, tough mucus, compared to boiled starch, or a little watery fluid.

3. *Bronchorrhœa.*—Most frequent in old people, especially in connection with cardiac diseases, this form is characterized by the *expectoration being very considerable in amount*, sometimes as much as four or five pints in the twenty-four hours; *either watery and transparent*, or *glutinous and ropy*, resembling a mixture of white of egg and water, and scarcely at all frothy. The *cough* is paroxysmal and often violent, but may be insignificant compared with the quantity of fluid discharged. Patients frequently obtain relief from dyspnœa and other unpleasant sensations, after a spell of coughing. In severe cases there may be loss of flesh and proportionate weakness.

PHYSICAL SIGNS.—The only signs directly due to chronic bronchial catarrh are: 1. *Rhonchal fremitus.* 2. *Harsh respiratory sounds, often weak, with prolonged expiration.* 3. *Sonorous and sibilant râles*, with some *large mucous râles towards the bases*, the latter rarely abundant, and varying in characters, according to the consistence of the contents of the tubes. Other signs are generally present in cases of long duration, but they are dependent upon emphysema and other morbid changes accompanying the catarrh.

PROGNOSIS.—When chronic bronchitis is confirmed, it can only very rarely be thoroughly cured. The chief dangers are, that it will become more extensive or induce emphysema, dilated bronchi, collapse, or phthisis; or that an acute attack might supervene, which is very dangerous.

TREATMENT.—From what has just been stated, it is obvious that all cases of chronic bronchitis ought to be thoroughly attended to as early as possible. The patient must be removed from every source of possible irritation and observe due precautions against exposure, wearing warm clothing, with flannel next the skin, and if a suitable climate cannot be obtained, it will be well to keep indoors during bad weather, or, if obliged to go out, to wear a respirator.

It is very important to look to the *state of the heart, digestive organs*, and *general system*. If cardiac disease is present, digitalis is often very useful, as infusion or tincture. By relieving dyspepsia and keeping the bowels freely open, much good may also frequently be done. Any constitutional diathesis present must be attended to, especially gout, rheumatism, rickets, and tuberculosis, as well as a plethoric or anæmic state of the blood. A great many cases of chronic bronchitis do well under a course of treatment by tonics and good diet, with some stimulant, especially if there is abundant expectoration, with debility and wasting. Quinine, ferruginous preparations, mineral acids with bitter infusions, are often very valuable, and also cod-liver oil. In some cases mineral nervine tonics, such as sulphate or oxide of zinc, are beneficial.

Much discrimination is requisite as regards the employment of remedies more immediately directed against the local complaint. The main indications are to limit excessive secretion; to assist expectoration, if it is difficult; to allay irritable cough; and to subdue spasm of the bronchial muscular fibres. The first indication is carried out by the internal administration of chloride of ammonium; balsams and resins, especially balsam copaibæ, ammoniacum, or galbanum; astringent preparations of iron, acetate of lead, mineral acids, or tannic or gallic acid; and by employing inhalations of steam with tar, creasote, carbolic acid, or naphtha, or *very dilute* dry inhalations of iodine, chlorine, balsamic and resinous vapors, or that of chloride of ammonium. The other [illegible] are mentioned [illegible] must be observed [illegible] accumulation [illegible] carbonate [illegible] inhalations are [illegible] Tincture of Indian [illegible].

[illegible] warm plaster, [illegible] blisters, croton [illegible] are frequently ser-[illegible]

[illegible] beneficial in many [illegible] warm climate, [illegible] exposed to cold [illegible] needs a soft [illegible] temperature. If [illegible] warm, and more or less [illegible]. Bournemouth, [illegible] in this country; and [illegible] Algiers, and Corfu, [illegible].

[illegible] bronchitis, usually calls [illegible].

PLASTIC OR CROUPOUS BRONCHITIS.

A few brief observations must suffice for this rare complaint. Young adults suffer most frequently, and it is rather more common among females. It is supposed to be due to some diathetic condition, and is said to be generally associated with a weak constitution, and sometimes with tuberculosis.

A plastic exudation forms in the tubes, producing whitish casts, varying in size according to the tubes affected, also greatly in extent, either hollow or solid, and sometimes presenting concentric layers. It consists of an amorphous or fibrillated substance, with granular matter, oil-globules, and cells, some of which are nucleated. It is not merely altered blood, associated with bronchial hemorrhage, as some suppose.

SYMPTOMS.—Almost always this affection is chronic, with acute exacerbations. *The symptoms* are *fits of cough* and *dyspnœa,* more or less frequent, severe, and prolonged, being sometimes extremely aggravated; followed, and usually relieved, by the expectoration of the fibrinous masses, which, on being unravelled under water, exhibit tree-like casts of the tubes. There may be some hæmoptysis. Sometimes extensive bronchial catarrh is set up, or pneumonia, and there may be much pyrexia. In the intervals patients may be quite well.

The *physical signs* indicate *obstruction of the tubes,* more or less complete and extensive, leading to emphysema or collapse. Dry râles are often present, especially sibilant, and a few mucous rhonchi.

A case has recently been under treatment at University Hospital, the patient being a tolerably healthy-looking young man, who brought up a quantity of casts almost daily, and who scarcely suffered at all.

TREATMENT.—During the attacks of dyspnœa and cough, inhalations, sinapisms, turpentine fomentations, or blisters, to the chest, and the internal administration of sedatives, with tartar emetic or ipecacuanha wine, might be tried. For the cure of the complaint there is no known remedy. Tonics, cod-liver oil, change to a warm climate, or a *long sea-voyage,* seem to be most beneficial. Tartar emetic, iodide of potassium, alkalies and their carbonates, mercury, inhalations of iodine, &c., have been tried, but usually without success.

CHAPTER X.

PNEUMONIA—INFLAMMATION OF THE LUNGS.

INFLAMMATION of the tissues of the lungs occurs under different forms, each of which requires separate consideration.

I. ACUTE CROUPOUS PNEUMONIA. LOBAR PNEUMONIA.

ETIOLOGY.—*Predisposing causes.* 1. *Age.* Most cases occur between 20 and 30, but no age is exempt, and the young and old are very liable to suffer. 2. *Sex.* More males are attacked, probably from exposure to the exciting causes. 3. *Social position, occupation, and habits.* Poverty, residence in large towns, intemperance, and occupations involving exposure or overexertion, predispose to pneumonia. 4. *State of health.* Pneumonia is very liable to occur in those who are constitutionally feeble, *or who are suffering from any lowering chronic or acute disease,* as well as during convalescence from the latter. 5. *Previous attacks* increase the liability. 6. *Climate and season.* Those characterized by coldness, *rapid changes in temperature,* much moisture, or the prevalence of northerly and easterly winds, greatly predispose to the occurrence of pneumonia.

Exciting causes. 1. Most cases of *primary* pneumonia arise from *a sudden chill when the body is heated;* exposure to cold or wet; or a cold draught. 2. *Direct irritation,* not unfrequently produces pneumonia, which may be due to the inhalation of very hot or cold air, or irritating gases; foreign bodies, such as food; blood, especially apoplectic clots; or morbid deposits, *e.g.*, tubercle, cancer, diphtheritic or croupous exudation. 3. *Injury to the chest* often leads to local inflammations, such as contusion, fracture of the ribs, or perforating wounds. Some are of opinion that violent exertion is occasionally a cause, but this is very doubtful. 4. Pneumonia is frequently *secondary* to various acute affections, especially low fevers and blood-diseases, *e. g.*, measles, small-pox, typhus, typhoid, pyæmia, puerperal fever, &c. It also is very prone to arise in chronic blood-diseases, but in these cases there is some other exciting cause, which may be undiscoverable, acting on a depraved system. 5. *Epidemic pneumonia* has been described. It may assume this character in connection with influenza or other epidemics, especially if there is much overcrowding, with deficient ventilation. It is also said to occur in malarial districts. 6. *Intense* or *long-continued pulmonary congestion* is very liable to cause pneumonia, especially in connection with heart-disease, or "hypostatic congestion," which occurs in dependent parts in old and weak individuals who are confined to bed from any cause (hypostatic pneumonia).

Some authorities regard *primary pneumonia* as a "specific fever," with a local manifestation, as in the case of other fevers.

ANATOMICAL CHARACTERS. — Pneumonia is characterized pathologically by hyperæmia and œdema, followed by the formation of a fibrinous exudation *in the interior of the air-vesicles and minute bronchi*, which undergoes various changes. It is necessary to describe the appearances in different stages.

Dr. Stokes has described a *preliminary stage*, in which there is *brilliant arterial redness, with abnormal dryness*, but no other alterations. Those usually seen, however, are as follows:

1st or Engorgement stage. External characters. Color is dark-red, reddish-brown, violet, or livid, not uniform, but mottled. The lung feels heavy, and the affected part is firmer, more resisting, and less elastic than in health, retaining impressions of the finger, and not crepitating much. *On section*, a quantity of reddish or brown, bloody serum escapes, more or less aerated, and somewhat viscid. The lung-texture still perceptible, and pieces float in water. Consistence is diminished, the tissue being more easily torn.

2d or Exudation stage. Red hepatization. External characters. Color is more uniform, and dull-reddish. *Weight* is markedly increased, and the lung is sometimes evidently distended, being marked by the ribs. The tissue feels solid and firm, absolutely inelastic and non-crepitant. *A section* is dull reddish-brown, with some grayish variegation, and opaque, but it becomes brighter after exposure. Very little fluid escapes, often none, except on pressure, it being thick, dirty, sanguineous, and non-aerated. A characteristic *granular* appearance is usually visible, especially on tearing the affected part, but it is less marked in children, or when the exudation is soft, as in low fevers, and in old people. All trace of lung-texture has disappeared, and it is very brittle, breaking down easily under pressure. Fragments sink in water instantly. The microscope reveals amorphous fibrin, with abundant newly-formed cells, and some granules.

3d, or Gray hepatization stage. During this period, the color gradually fades, becoming ultimately gray, with a greenish or yellowish tint; the granular appearance on section is less distinct or lost, and the lung-tissue becomes more or less soft or pulpy. A quantity of dirty, grayish, almost puriform fluid escapes, either spontaneously, or on pressure or scraping. This stage presents all grades, from slight softening to what is termed "purulent infiltration." There is excessive cell-formation, with fatty degeneration and liquefaction of the inflammatory products. In favorable cases these materials are ultimately either absorbed or expectorated, and the lung-tissue remains unaltered in structure.

Such being the ordinary course of a case of pneumonia, other *pathological terminations* are observed in rare cases, viz., 1. *Formation of one or more abscesses*, which may open into the bronchi or pleura, or become encapsuled, the contents undergoing cheesy or calcareous changes, and complete closure may ultimately take place. 2. *Gangrene.* 3. *Caseous degeneration.* 4. *Chronic induration or cirrhosis.*

The *right lower lobe* is most frequently involved, but the inflammation may spread to the entire lung, or affect both. Sometimes it begins in the middle or upper lobe, and in the old or cachectic, it often extends from above downwards.

The parts of the lungs not pneumonic are frequently congested and œdematous, and more or less bronchitis is present. *Pleuritic exudation* is commonly observed, but not often abundant effusion. The right cavities of the heart and venous system are overloaded, the various organs being congested, and fibrinous coagula are formed in the heart and vessels, the blood being exceedingly rich in fibrin, exhibiting the "buffy" coat markedly.

SYMPTOMS.—In some cases there are premonitory signs of general indisposition for a short time. In *primary* pneumonia the attack sets in usually very suddenly, the *invasion* being attended with a *single, severe, more or less prolonged rigor.* There may be great prostration, with pyrexia; vomiting; or nervous symptoms, viz., headache, delirium, restlessness, stupor, or, in children, convulsions. The special symptoms are *local* and *general.*

Local.—Pain in the side is usually present, being occasionally simultaneous with the rigor, or even preceding it, but, as a rule, setting in after a variable interval. Its *seat* is generally about the mammary region, and, though considerable, it is not extreme, at all events for a long period, being tolerably easily relieved. In *character* it is commonly stabbing or piercing, being increased by a deep breath and cough. Tenderness is often observed, and sometimes hyperæsthesia of the skin. *Dyspnœa* is an early and prominent symptom, as evidenced by the sensations of the patient; the rapidity of the breathing, which, however, is abrupt and shallow; by the working of the nostrils; and difficulty of speech. The pulse-respiration ratio is greatly disturbed, the respirations ranging from 30 to 60, or even 80. Occasionally orthopnœa exists. *Cough* also commences speedily. It does not come on in violent paroxysms, but is short and hacking, often spasmodic and difficult to repress, especially when the patient is made to breathe deeply, or to sit up, while it causes much distress. Soon *expectoration* occurs, the sputa presenting peculiar characters. They are scarcely at all frothy, but exceeding *viscid* and *adhesive*, so that they are discharged only with much difficulty, have to be wiped from the mouth, and the vessel which receives them may often be overturned without their escaping. They have a "rusty" color, or present various tints of red, from admixture of blood, and as the case progresses, changes of color are observed, through shades of yellow, until finally they become merely bronchitic. The *microscope* reveals epithelium, blood-disks, so-called granular or exudation cells, sometimes minute ramifying coagula (which may be evident to the naked eye as small, structureless masses in the sputa), and, at last, pigment-cells, free-pigment, abundant granules and oil-globules, free nuclei, or, occasionally, pus-cells. *Chemical examination* yields mucin, albumen, often sugar, salts, especially chlorides, and, it is said, sometimes a special acid. The *expired air* may be cool, and is deficient in carbonic anhydride.

Such being the *ordinary local symptoms* of acute pneumonia, it must be borne in mind that very considerable deviations are observed, due to the patient being very young or old, or feeble; to the portion and extent of lung-tissue affected; the type and course of the pneumonia; or to its being secondary. It is impossible to point out here the modifications met with, but it may be mentioned that pain and other symptoms are sometimes very slight or absent (*latent pneumonia*); and that the sputa may be merely bronchitic, absent, or, in low cases, present the appearance of a dark, offensive, thin fluid, resembling licorice or prune-juice. Occasionally they are tinged with bile.

General.—These may be summed up generally as *severe pyrexia*, with *great depression and prostration.*

The skin soon becomes exceedingly hot and dry, having a burning, acrid feel. Sometimes perspiration takes place, but there is no relief. The *temperature* rises with great rapidity to 102°, 103°, 105°, or even higher. The maximum is generally reached on the second or third day, but it may occur just before the termination. It has been known to reach 107° in cases which recovered, and in fatal cases it has attained 109.4°. In a large number of instances, the temperature does not go beyond 103° or 104°. The daily variations are usually as follows: The temperature is lowest in early morning, and then begins to rise in the forenoon or soon after, attaining its maximum early in the evening. It then falls, but a slight rise again occurs in some cases at midnight, after which a gradual fall takes place. The remission ranges from ⅗° to 2.5°, but is seldom more than 1.8°. Usually it ceases altogether a day or two before the crisis. In rare instances, when pneumonia is associated with intermittent fever, the temperature becomes quite normal in the mornings (*intermittent pneumonia*). An extension of inflammation, or a relapse, will disturb the normal course. There is usually considerable flushing of the cheeks, which may be more marked on the pneumonic side; sometimes a tendency to darkness or lividity is observed, or the face may present a yellowish, earthy tint. The expression is either one of pain and anxiety or it is heavy and stupid. Herpes is frequently observed on the face about the second or third day.

The *pulse* is usually frequent, being, as a rule, in proportion to the extent of the pneumonia. It ranges generally from 90 to 120, but may be much above this. At first strong, full, and incompressible, it afterwards becomes weak, small, and yielding, sometimes intermittent or irregular. The sphygmograph is very useful in indicating its characters.

A prominent symptom in most instances is the *great prostration and feebleness* of the patient, which is very evident. The position assumed is generally on the back, with the head rather high, and it is often only with difficulty that the patient can be made to sit up.

The *digestive organs* present the ordinary symptoms associated with pyrexia, to a marked degree. The tongue tends to be dry, and the lips to crack. As occasional, and usually unfavorable symptoms, there may be dysphagia, severe vomiting, jaundice with enlarged liver, or diarrhœa. The ordinary *cerebral symptoms* are headache, sleeplessness, and restlessness, often with slight nocturnal delirium. The *urine*, in addition to being highly febrile, frequently contains a little albumen, and chlorides are very deficient or entirely absent.

In some cases, the symptoms assume an adynamic character, there being a dry, brown tongue, with sordes, and low nervous disturbance, in the way of delirium, stupor, coma, convulsions, twitchings, and tremors, affections of the senses, &c. (*typhoid pneumonia*). This is especially apt to occur if the patient is old, very weak, or intemperate; if the disease is secondary to certain acute and chronic diseases, or attended with great pyrexia; or if it goes on to suppuration or gangrene, which cause great prostration. In drunkards the symptoms at first often resemble those of delirium tremens, followed by collapse. Occasionally they simulate those of mania, or cerebral inflammation. The formation of pus is usually attended with severe rigors, and increase of pyrexia. If it collects in an abscess, it may be suddenly discharged along with fragments of lung-tissue.

There may be distinct signs of cyanosis, with distension of the right side of the heart and visible veins, and formation of coagula in the pulmonary vessels.

Physical Signs.—I. *Stokes's stage of arterial injection.* At this time the only sign is a *harshness and roughness of the breath-sounds*, which are usually exaggerated. I have had several opportunities of observing this.

II. *Engorgement-stage.*—1. *Respiratory movements* are deficient, partly on account of pain. 2. *Vocal fremitus* is often increased. 3. *Percussion* is usually not much altered, but may be *abnormally clear*, or *slightly deficient in resonance*. 4. *Respiratory sounds* are harsh and weak, or occasionally somewhat bronchitic. 5. The principal sign is the *true crepitant rhonchus*, which is heard over the affected part.

III. *Red hepatization-stage.*—1. There may be *slight enlargement of the side.* 2. *Movements* are greatly impaired, especially expansion. 3. *Vocal fremitus* is somewhat in excess. 4. *Percussion* as a rule reveals *dulness* with *increased resistance.* Sometimes the percussion-note is rather hollow, and of tubular, or even amphoric quality. When the pneumonia is at the base, a tubular or tympanitic note can sometimes be produced over the front of the upper part of the chest. 5. The *respiratory sounds* afford one of the most important signs. Frequently they are typically *tubular,* dry, high-pitched, whiffing or metallic; sometimes merely *blowing* or *bronchial.* 6. *Crepitant rhonchus* is often heard at the confines of the inflamed part. 7. *Vocal resonance or cry,* is *intensified,* usually *bronchophonic, high-pitched, sniffling,* and *metallic.* It may be almost *ægophonic,* or *pectoriloquous,* and occasionally *whispering pectoriloquy* is observed. 8. *There is no evident displacement of organs.* The *heart-sounds* are intensified over the affected part, and, it is said, a *systolic apex murmur* is sometimes heard.

IV. *Resolution-stage.*—The chief sign at this time is the addition of a *redux crepitant rhonchus,* and often of thin, bubbling râles, either large or small, of ringing or metallic character. The other abnormal signs disappear, sometimes with great rapidity, in other cases only slowly and gradually, or not at all. The dulness may diminish in patches. Occasionally *slight retraction of the chest* follows.

It is *at one or both bases* that these signs are commonly observed. Variations are met with, due to *the consolidation being extreme, the tubes being completely blocked up;* as well as *to the inflamed part being deep,* or other unusual conditions. *Diffuse suppuration* gives rise to abundant, liquid, bubbling râles. An *abscess* or *gangrene* is followed by the signs *of a cavity.* The signs of *bronchitis* and *pleurisy* are often present. In the unaffected parts respiration is exaggerated.

TERMINATIONS AND DURATION.—1. The majority of cases end in *complete recovery,* by *resolution.* Usually a marked *crisis* takes place, the temperature falling rapidly to, or even below the normal, while the pulse and respirations also diminish in frequency, and the other symptoms speedily abate, convalescence being soon established. It is attended with profuse perspiration; an abundant discharge of urine, which deposits lithates, oxalates, and phosphates, or sometimes contains blood; or occasionally, with diarrhœa, epistaxis and other hemorrhages, or a skin eruption. Considerable, and even fatal collapse may follow it. The crisis takes place usually from the third to the eleventh day, being most frequent about the end of the first week, but not necessarily on odd days, as some suppose. In some cases defervescence is by *lysis*, convalescence being protracted. Slow recovery may take place even after gangrene or abscess. A relapse sometimes happens. 2. *Death* may occur either from asphyxia, or, more commonly, from collapse and exhaustion. This may take place even after the crisis. 3. Rarely there is a *transition into a chronic state*, the exudation remaining unabsorbed, and the symptoms continuing, with irregular fever and loss of flesh, &c. Ultimately a form of phthisis is sometimes produced.

DIAGNOSIS.—This subject will be again alluded to, when considering the general diagnosis of acute lung-affections. At present it is only intended to call attention to the fact that pneumonia often comes on insidiously, and whenever this is probable, the chest should be frequently examined. It may also simulate low fevers, cerebral inflammations, &c.

PROGNOSIS.—Different observers have given very different statements as to the rate of mortality in this affection, but it is always one which must be looked upon as serious. The chief circumstances which increase the danger are—very early or advanced age; the female sex; pregnancy; debility from any cause; intemperance; the presence of chronic pulmonary, cardiac, or renal disease, or of very extensive old pleuritic or pericardial adhesions; the disease being secondary; both lungs being involved, or the whole of one, or its central or upper part; the sputa being very abundant and watery, or like prune-juice, or absent, with signs of accumulation in the lungs; the termination in diffuse suppuration, abscess, or gangrene; the occurrence of typhoid and severe nervous symptoms, or marked collapse; signs of apnœa; the existence of various complications, such as gastroenteric catarrh, pericarditis, parotitis, &c.; a low epidemic type.

TREATMENT.—Of course it is very important in treating pneumonia to attend to all the precautions requisite in the treatment of lung diseases in general, but the sick-room must be well ventilated. There are three main plans of treatment adopted in the management of this disease, viz.: 1. *Expectant.* 2. *Antiphlogistic.* 3. *Stimulant.* No uniform method can, however, be followed, but it is essential to consider each case in all its details, and modify the treatment accordingly.

1. The *expectant* plan, in which the patient is merely protected against injurious influences, properly fed, and symptoms are relieved, the cure of the disease being left to nature, is one which, unquestionably, may be carried out with advantage in many instances; but to apply it to all cases indiscriminately is most injudicious.

2. In the *antiphlogistic* treatment the chief remedies employed are *venesection*, or *local removal of blood, tartar emetic, calomel and opium, digitalis, aconite,* and *veratria.* It has been satisfactorily proved that *venesection* is rarely required, cases in which it might be indicated doing just as well without it, and in a great many instances it would be most injurious. It may relieve dyspnœa, and diminish fever, but only temporarily. It is sometimes requisite, to a moderate extent, in order to avert death from apnœa. *Local bleeding* cannot subdue the inflammation, but it is useful sometimes in mitigating symptoms. *Tartar emetic* is decidedly serviceable; where the patient is strong and plethoric. It should not be given in large doses; from gr. ½ to gr. i every four hours being quite sufficient for an adult, and it may be combined with compound tincture of camphor and hydrocyanic acid. Of the use in this disease of the other drugs mentioned I have no experience.

3. A great many practitioners have recourse to the *stimulant* treatment, giving large quantities of alcohol, in the form of wine or brandy, with ammonia, chloric ether, camphor, &c. The routine use of these remedies, however, is to be equally deprecated with those of the opposite class, for they are often unnecesssary, and may do more harm than good. In many instances they are most valuable, the quantity to be given depending upon the nature of the case, and their usefulness or the reverse being judged of by the effects produced. It is a good rule, if in doubt, to try them carefully. The main indications for stimulants are—delirium (if not associated with vascular excitement); a very rapid, weak, or dicrotic pulse; any signs of adynamia, or collapse, with

low nervous symptoms; the patient being old or feeble; and the pneumonia being secondary. In all low forms of the disease the only chance is in *free stimulation*, a pint or more of brandy being often required in the twenty-four hours, and, *if necessary, there ought to be no hesitation about giving this quantity.* At the same time full doses of carbonate of ammonia, with bark, spirits of chloroform, ether, camphor, musk, and such remedies must be administered. In some cases quinine with iron is useful, and in very adynamic conditions oil of turpentine has been recommended, or this may be introduced by enema. In most instances it is advisable to give a little wine or brandy after the crisis, as there is often much exhaustion at this time.

Attention to *diet* is of considerable moment. In all cases a good quantity of beef tea and milk should be administered at regular intervals, and abundant support is often needed. Cooling drinks are useful, or some saline drink may be freely taken.

Local treatment.—The application of cold to the chest has been advocated, either by wet compresses frequently changed, or by ice-bags covered with muslin. If employed, great caution must be exercised. Hot fomentations or poultices, alone or with anodynes, turpentine fomentations, or sinapisms, are used to relieve pain. Blisters are only needed in the advanced stages, as a rule, and not then if absorption is going on satisfactorily.

Opiates are frequently required, with the usual precautions, to relieve pain, for which *hypodermic injection of morphia* is most valuable, to procure sleep, and to alleviate distressing cough. *Hydrate of chloral* is often useful, as well as other sedatives and narcotics. If there is high pyrexia, *full doses of quinine* may be tried, but it might be requisite to have recourse to baths. Should expectoration be very difficult, on account of excessive viscidity of the sputa, alkalies are recommended. Chloride of ammonium, with squill and senega, are useful in such cases, especially during the later stages. Every care is necessary during convalescence, and the patient should be kept under observation until thoroughly convalescent. Tonics are serviceable at this time, with good diet, and cod-liver oil in some cases.

II. Catarrhal Pneumonia. Disseminated or Lobular Pneumonia. Broncho-Pneumonia.

Etiology.—This form of inflammation may occur as an acute or chronic affection, and, in the great majority of cases, it follows bronchitis, being either the result of direct extension of inflammation along the minute bronchi to the air-vesicles, or, more commonly, being set up in *collapsed lobules*. *Acute catrrhal pneumonia* is by far most common among children, being particularly observed in *hooping-cough*, *measles*, *diphtheria*, and *influenza*, but it may be independent of these affections. It is predisposed to by debility, inhalation of impure air, and a long-continued recumbent posture. There is reason to believe that the pneumonia occurring in the aged and feeble, and in those dying from acute or chronic diseases, is not unfrequently of this nature. As a *chronic affection*, resulting from gradual extension of bronchial catarrh into the alveoli, this form of pneumonia is now looked upon by many pathologists as the origin of a large proportion of cases of phthisis. It may be produced in connection with dilated bronchi.

Pathology and Anatomical Characters.—There is no fibrinous exudation, as in the croupous variety of pneumonia, but merely a proliferation of the cells lining the alveoli, which become so abundant as to fill and distend these. In favorable cases they undergo liquefaction, and are absorbed or discharged. Sometimes abscesses are formed, or the cells remain, becoming dry, withered, and undergoing cheesy degeneration, ultimately causing destruction of the lung-tissue, or, it is supposed, sometimes giving rise to tubercle. *Chronic interstitial pneumonia* may be produced. When following collapse, the morbid appearances are usually confined to isolated lobules, but by their coalescence, large tracts of lung-tissue may be involved, especially at the bases and along the posterior borders. Generally they are mingled with signs of bronchitis, congestion, with œdema, or merely collapsed lobules. The inflamed lobules are disseminated irregularly through both lungs, being most abundant towards the bases, along the lower free border, and at the surface. They vary in size considerably, and when superficial, have a pyramidal or wedge-like form, with ie base outwards, projecting somewhat beyond the surface. hey feel like firm, solid knots, but are in reality friable, breaking own readily under pressure. A section presents a more or less rayish-yellow color, gradually fading into surrounding conges-on, and a granular aspect generally. A whitish, opaque, non-othy fluid can be scraped or pressed from the surface, containing bundant cells, many of which, under the microscope, resemble us and mucus corpuscles. In the lobules there are often little ilated bronchi, containing a purulent fluid. The affected parts nk instantly in water. The appearances just described are iose met with when the inflammatory process is well established, ut gradual transitions are observed from merely collapsed bules.

When independent of collapse, very numerous, small, ill-defined, hitish-yellow spots are seen scattered through congested and dematous lung-tissue, only slightly granular, and yielding an paque, milky fluid, on pressure. In some parts there are little avities, containing a pus-like matter, but many are of opinion hat this has gravitated into the minute bronchi or air-vesicles, r has been drawn in during inspiration.

SYMPTOMS.—The symptoms of acute catarrhal pneumonia do ot call for any lengthy description, but only such points in its linical history will be indicated as enable it to be distinguished rom mere bronchitis, collapse, or croupous pneumonia. Usually ccurring in the course of other complaints, and subsequent to ronchitis, its symptoms may set in very speedily, as in measles, r gradually as in hooping-cough, but they are generally modi-ications of those previously existing. Very rarely do any rigors ccur, or other marked premonitory symptoms, such as are ob-erved in ordinary pneumonia. *Pyrexia* is a most important sign, he temperature rising often to 103°, 104°, or 105°; the remissions, owever, are considerable, and *irregular as to time*, while renewed xacerbations are liable to occur after the temperature has be-ome normal. The *skin* often perspires freely, and is not pungent. he *pulse* increases in frequency, but soon tends to be feeble and rregular. The chest-symptoms are *increased dyspnœa*, the res-irations being exceedingly frequent; a *change in the cough*, which ften becomes short, harsh, hacking, and painful, the child endeavoring to repress it, having an expression of pain, or crying; and *diminished expectoration*, the sputa being scarcely ever "rusty." *Physical signs* are exceedingly uncertain. In the parts corresponding to the consolidated portions there may be increased vocal fremitus; dulness; bronchial breathing; small, scattered, sometimes ringing râles; and bronchophony.

The *course* of the disease may be exceedingly acute and rapid, or subacute. In the former class of cases there is generally great restlessness and anxiety, or the patient may soon fall into a stupid and apathetic state. Signs of cyanosis are common. Loss of strength and emaciation are prominent characters, the latter being especially marked in the less rapid cases. The subsidence of the disease, in cases of recovery, is usually *very gradual and protracted*, there being *no crisis*, but an irregular defervescence by lysis. As already mentioned, it may lead to permanent injury to the lungs.

TREATMENT.—All lowering measures are decidedly injurious. Ipecacuanha wine is useful, with salines; or ammonia and senega, if there is much debility. Abundant nourishment is required, and frequently alcoholic stimulants. Emetics are sometimes serviceable to aid in unloading the lungs. The continued application of *cold compresses to the chest* has been strongly recommended. Sinapisms are often necessary. Great care is required during convalescence, and tonics, good diet, cod-liver oil, wine, &c., are indicated.

III. CHRONIC OR INTERSTITIAL PNEUMONIA. CIRRHOSIS OF LUNG. FIBROID PHTHISIS. FIBROID DEGENERATION. INDURATION WITH DILATED BRONCHI.

ETIOLOGY AND PATHOLOGY.—The forms of pneumonia already described may become more or less chronic, but the condition now under consideration is one in which the lung is greatly contracted and indurated, pigmented, its vesicles being obliterated, and the bronchial tubes usually dilated. These changes are generally considered as partly due to proliferation of the connective tissue, interlobular, subpleural, &c.; and partly to the formation of a nuclear growth, which develops into extensive tracts of fibroid tissue; but some regard them as the result of a chronic inflammatory process, or a fibroid change, affecting *the walls of the alveoli* themselves. There can be no doubt but that in the great majority of cases this disease is *secondary* to some previous pulmonary affection, being the consequence of irritation. The conditions by which it may be thus produced are: 1. Very rarely acute croupous pneumonia. 2. Catarrhal pneumonia frequently. 3. Dilatation of the bronchi, though in these cases Dr. Wilson Fox thinks that it is preceded by catarrhal pneumonia. 4. Collapse of the lung. 5. Pleurisy, but it is doubtful whether the change can then extend to any depth, unless pneumonia precedes it. 6. Bronchial irritation from inhalation of mineral and other particles, such as steel, coal, or stone-dust, cotton, &c. 7. Various deposits (tubercle, cancer, &c); phthisical cavities; pulmonary hemorrhage, or abscess; or injury. It is then localized, and may really be a method of cure.

Some pathologists, however, consider that this disease is, in some instances, essentially *primary*, being, as some think, the result of a *chronic inflammatory process* in the interstitial tissues, resembling that which takes place in cirrhosis of the liver; or, as others believe, a *direct*, *idiopathic*, fibroid change, degeneration, or substitution in the walls of the alveoli, not associated with inflammation, and that this process tends to spread through the lung. In my own experience, no cases bearing out this view have come under my notice.

It is necessary to allude more particularly to the relation of *dilated bronchi* to chronic pneumonia. Doubtless in many cases this dilatation is *secondary* to the induration, but there is every reason to believe that the dilatation is sometimes the original morbid condition, and gives rise to the fibroid change. The immediate causes of *bronchiectasis* have been supposed to be: 1. Morbid changes in the walls of the bronchi, diminishing resisting power. 2. Increased pressure of the air during cough, in parts unsupported, or during inspiration, in consequence of obliteration of air-vesicles, being then compensatory. 3. Persistent pressure of stagnant secretion. 4. Contraction of lung-tissue, dilating inclosed bronchi.

ANATOMICAL CHARACTERS.—In the early stage the tissue is congested, but it afterwards becomes paler, and may exhibit extensive tracts of a homogeneous-looking substance, containing nuclei. When the process is advanced, the appearances are very characteristic. The lung is contracted and shrunken; its tissue is hard and dense, cannot be torn, and creaks on being cut. A section is smooth and dry, pigmented, often presenting a marbled gray aspect, while fibrous bands or masses may be seen traversing the section, some of the former being probably obliterated and thickened bronchi or bloodvessels. The vesicular tissue is destroyed, but many of the bronchi are dilated as a rule. The fibrous growths may ultimately become caseous.

The extent of lung involved varies considerably. The change may be limited at first to the bronchi, and the tissue immediately around; or it may only be seen surrounding deposits or cavities. A peculiar feature of this disease is, that *it is usually limited to one lung*, which it may affect throughout, or be confined to the base, apex, or middle part.

The bronchi may be extensively dilated, and of a fusiform shape; or present one or more limited globular enlargements. Their size varies considerably. After a time their inner surface becomes irregular, and occasionally ulcerated; they contain a muco-purulent, or purulent substance, often fetid; gangrene or hemorrhage sometimes takes place in connection with them. Their contents may ultimately dry up, and become caseous, or even calcareous, and finally obliteration may take place.

The pleura is usually thickened, sometimes extremely so, and adherent. Emphysema is common in unaffected parts of the lungs, and other morbid conditions are frequently seen, with which the chronic pneumonia is associated.

SYMPTOMS.—This disease runs a *very chronic course*, and its symptoms at first are not definite, but when it is fully established, it presents well-marked clinical characters. The *local* symptoms are dragging pains about the sides; shortness of breath; cough, which, when the bronchi are dilated, comes on in severe paroxysms, followed by abundant expectoration, which is discharged with much difficulty and is often exceedingly fetid, depositing a thick sediment on standing, and containing caseous particles. The *general* symptoms are *very gradual* loss of flesh and strength, anæmia, sometimes night-sweats, but *there is no pyrexia*, as a rule, or it is but slight. After a time signs of obstructed circulation may set in.

The *physical signs* indicate dense consolidation, and contraction of lung, with cavities due to enlarged bronchi. 1. The whole side is retracted, often extremely. 2. Movement is deficient or absent. 3. Vocal fremitus may be increased or diminished. 4. Percussion gives a hard, wooden, high-pitched sound, with *marked resistance.* Occasionally the sound is tubular in some parts. 5. Respiration sounds differ in different parts, being weak or absent, bronchial, tubular, or cavernous. After a cough they are often heard where previously absent. 6. Various râles may be heard in the dilated bronchi. 7. Vocal resonance is variable, being deficient, bronchophonic, or pectoriloquous sometimes. 8. The heart is often displaced *towards the affected side*, the opposite lung encroaches in this direction, and the liver is drawn up.

TREATMENT.—The management of this disease is really that of a certain form of phthisis. Nourishing diet is necessary, with tonics, iron, cod-liver oil, &c. The expectoration can be improved and limited by inhalations of carbolic acid or creasote, and care must be taken that the secretions are not allowed to stagnate in the bronchi. Counter-irritation is often useful, especially by iodine. Iodide of potassium has been recommended internally.

CHAPTER XI.

PULMONARY CONGESTION—ŒDEMA—HEMORRHAGE.

THESE morbid conditions may be considered together, as they are in many instances but stages of the same process.

ETIOLOGY.—*Hyperæmia* may be active, mechanical, or passive. *Active congestion* results from: 1. Increased cardiac action from any cause. 2. Probably hypertrophy of right ventricle sometimes. 3. Irritation produced by various conditions of the air inspired, or by deposits, &c., in the lungs. 4. Various pulmonary affections, which interfere with the circulation in the capillaries in some parts, in consequence of which those of other parts become overloaded. 5. Inflammatory pulmonary diseases, of which congestion is the first stage, and which it often accompanies. 6. Obstruction to the entrance of air into the lungs during inspiration, and hence rarefaction of the residual air, with diminished pressure on the vessels. The causes of *mechanical hyperæmia* are: 1. Some cardiac disease in the great majority of cases, interfering with the passage of blood through the left cavities of the heart, especially *mitral disease*, but probably also a feeble dilated condition of the left ventricle. 2. Very rarely a tumor pressing on the pulmonary veins. *Passive congestion* is most frequent in low fevers, and other conditions which depress the action of the heart greatly, and disturb the capillary circulation, especially in the aged and feeble; it is seen chiefly in dependent parts, usually the bases and posterior portions of the lungs, its production being aided by gravitation, and is then named "hypostatic." Probably it may also arise as the consequence of a very weak dilated right ventricle.

Œdema is, as a rule, the result of long-continued, or intense congestion, from any cause, but *especially when associated with cardiac disease.* It may be but a part of a general dropsy.

Hemorrhage into the lungs may occur under the following circumstances: 1. As a result of congestion. 2. *From the lodgment of an embolus in one of the branches of the pulmonary artery.* This embolus is usually associated with *cardiac disease*, and is detached from a clot in the right ventricle, but it may be conveyed from more distant parts. 3. From a diseased condition of the branches of the pulmonary artery; this often materially aids in the production of pulmonary hemorrhage. 4. As the consequence of injury to the lungs or chest. 5. From morbid growths, cavities, ulcers, &c., in the lungs. 6. In connection with some morbid condition of the blood, such as is met with in scurvy, purpura, or malignant fevers.

ANATOMICAL CHARACTERS.—*Hyperæmia* gives rise to a more or less deep-red color, which may become bluish, purple, livid, or blackish-red. The part affected is enlarged, relaxed, moist, crepitates imperfectly, and a quantity of aerated, bloody fluid escapes on section; pieces float in water. In extreme cases the vesicular structure is scarcely apparent, and the tissue breaks down very readily, when the lung is said to be "splenified." *Hypostatic congestion* may go on to *hypostatic pneumonia.*

Œdema is necessarily chiefly observed in dependent parts, and is always present, more or less, when congestion exists. The lungs are enlarged, tense, do not collapse when the chest is opened, and have a peculiar feel, retaining the impression of the finger after a time. The tissues are very moist, and on section a large quantity of serous fluid escapes, either red or colorless, according as it is associated with congestion or not, and it may or may not be frothy. The lungs are either congested or pale.

Hemorrhage is described as occurring under four forms, viz.: 1. *Circumscribed, nodular, hemorrhagic infarction,* or *pulmonary apoplexy.* 2. *Diffuse,* or *pulmonary hemorrhage proper.* 3. *Interlobular.* 4. *Petechial,* in connection with blood-diseases. The last two are very rare, and do not call for further notice.

Hemorrhagic infarction is due to *embolism,* and the blood comes from the capillaries of the pulmonary artery, being discharged into the alveoli and minute bronchi, as well as outside them, but there is no laceration of tissue. The *size* of an accumulation varies considerably, depending upon that of the branch of artery obstructed, and it may measure from ½ an inch to 4 inches or more in diameter. When in the interior it is large, near the surface small, and wedge-shaped or pyramidal, with the base outwards, projecting a little beyond the surface. The most frequent seat of infarctions is the interior of the lower lobes, and about the root of the lung, but at the same time there may be some near the surface, and they are often numerous. They are circumscribed and defined, and may only correspond to a single lobule, but there is congestion and œdema around. They feel very firm and hard, a section appearing solid, airless, slightly granulated, dark-red or blackish, while coagulated blood can often be scraped away, and then lung-structure may be perceptible.

The changes described when speaking of apoplectic clots in general, take place in connection with those in the lungs, and the blood may ultimately be completely removed, the tissues being restored to their normal condition. In many cases a permanent, blackish, pigmented knot is left. Pneumonia or abscess is sometimes produced, the clot softening in the middle, or it may undergo caseous or calcareous degeneration, and be encapsuled.

In the *diffuse* form, a vessel of some size gives way, the lung-tissue being lacerated, and an irregular, potential cavity being formed, varying in size, and containing a mixture of fluid and clotted blood. The pleura may give way, and blood escape into its cavity.

It is necessary to allude briefly here to a condition known as "brown induration of the lung." This follows long-continued congestion, especially that due to mitral disease, and is characterized by the accumulation of granular, yellowish pigment, probably hæmatoidine, in enlarged epithelial and granular cells, which collect in the alveoli; with varicose dilatation of the capillaries; and probably thickening of the alveolar walls. The pigment may change into black, and may finally be found free. The lungs are increased in bulk and do not collapse; heavy, compact and inelastic; and have a yellowish tint, passing into brown or reddish-brown. On section, in addition to the general change of color, red spots are seen, shading into black, and a brownish fluid may be expressed. Various degrees of the change are observed, and the extent affected differs much, while infarctions are often present at the same time.

SYMPTOMS.—These are not easy to define, as they are usually only exaggerations of some previously existing. In all these conditions, one of the most obvious symptoms is *dyspnœa*, either coming on for the first time, or being more severe, sometimes amounting to orthopnœa. A feeling of tightness or oppression is often experienced in the chest, but pain is generally absent. There is *cough*, which, in œdema, is attended with *very profuse, watery expectoration;* and, when hemorrhage exists, more or less blood is discharged, which may have a *dull-brownish*, or *bistre-color*, or *be almost black*. If a clot gives rise to inflammation, there will be pyrexia, and other symptoms indicating this complication.

PHYSICAL SIGNS.—1. Movements are often diminished. 2. Percussion-sound is at first *abnormally clear* in congestion, but afterwards becomes more or less deficient. There may be *localized dulness* in connection with hemorrhages. 3. Respiratory sounds are weak and harsh; in hemorrhage, they may be bronchial. 4. Abundant, small, liquid, bubbling râles are heard, when œdema exists; localized moist râles may also be perceptible over hemorrhages, and here there may be ultimately signs of pneumonia, abscess, &c. 5. Vocal fremitus and resonance may be increased or diminished, but are quite unreliable.

PROGNOSIS.—As a rule, these affections are very serious, because they complicate dangerous conditions already existing.

TREATMENT.—Much will depend on the exact nature and extent of the changes, and the conditions which cause them, or with which they are associated. Free dry cupping of the chest is often very useful, and sometimes local removal of blood. It is important to attend to position. Good diet, tonics, and stimulants are frequently necessary. Care must be taken in œdema that the lungs are emptied as much as possible. In diffuse hemorrhage astringents are required.

GANGRENE OF THE LUNG.

ETIOLOGY.—The conditions under which gangrene of the pulmonary tissue may arise are as follows: 1. As the result of *local disease*, viz.: acute or chronic pneumonia, phthisis, cancer, hydatids, bronchial dilatations. 2. From an *embolus* obstructing the nutrient vessels. 3. In connection with *blood-poisoning*, as after low fevers, pyæmia or septicæmia, glanders, or poisoning by venomous animals. 4. In extreme exhaustion from want of food and bad hygienic conditions, or from disease. 5. In certain *nervous diseases*, it being observed occasionally in chronic dementia, chronic softening of the brain, alcoholism, and epilepsy.

ANATOMICAL CHARACTERS.—This disease is either *circumscribed* or *diffuse*. The *circumscribed* variety is that usually seen, but it may become *diffuse*. The part involved is *distinctly defined*, but it varies much in extent. Usually the *size* is from that of a hazel-nut to a walnut, but a considerable portion of a lobe may be gangrenous. The lower lobes and the superficial parts of the lungs are most liable to be affected. The gangrenous portion soon becomes moist, softened, pulpy, bluish-green, and extremely fetid, or it may have a greenish-black core, with broken-down lung-tissue, a stinking, irritating liquid escaping on pressure. The substances may be discharged through a bronchus, and leave a ragged sloughy cavity, often with inflamed tissue around. Vessels frequently traverse this, but as coagula have formed in them, hemorrhage does not take place as a rule. Rarely an opening may be formed into the pleural cavity, or even, in consequence of adhesions between the two surfaces of this membrane, into the subcutaneous cellular tissue. Subsequently, in very exceptional cases, a fibrous capsule may form, the sphacelated portion is expelled, a cavity forming healthy pus is produced, and ultimately this may close up and cicatrize.

The *diffuse* form *does not present any line of demarcation*, but runs into or is mixed up with congested, inflamed, or œdematous lung-tissue. A whole lobe, or the greater part of a lung, may be implicated, being softened to pulpiness, greenish or brownish-black, or black, more or less saturated with a dirty, grayish-black liquid, and, in short, in the state of a moist, stinking, putrid slough.

SYMPTOMS.—The only two symptoms which indicate gangrene of the lungs are *extremely fetid breath*, and the *expectoration of gangrenous matters, with fragments of lung-tissue.* The former may precede the latter for some days, and it is sometimes only observed at intervals. It must be remembered, however, that this symptom is present in some cases of chronic bronchitis. The sputa are subsequently foul, frothy, partly liquid, partly muco-purulent, often dirty, brownish or blackish, containing gangrenous particles, occasionally fat crystals, and *elastic fibres may be detected in some cases.* More or less blood is often present, and death may occur from hemorrhage. On standing, the sputa separate into layers, and form a thick sediment. The *general* symptoms in most cases are those of extreme depression, adynamia, and collapse, with low, nervous symptoms, ending in speedy death. If the gangrenous materials are swallowed, severe diarrhœa, with tympanitis, sets in. Emboli may be carried from the lung, and produce septicæmic abscesses elsewhere. Occasionally death takes place by a slow process of hectic, or, very rarely, recovery may ensue.

The *physical signs* are at first merely indistinct breathing, with

followed, if the gangrene is circumscribed, by more or less
d signs of a cavity, containing thin fluid. Extensive bron-
or pleurisy is often produced.

GNOSIS is necessarily exceedingly grave.

ATMENT.—The measures to be adopted are, to administer
ant nourishment, with large quantities of alcoholic stimu-
ammonia, and bark, ether, camphor, mineral acids, or
e; to use frequent inhalations of creasote, carbolic acid,
por, or turpentine; to encourage expectoration in every
and to let the patient gargle with some antiseptic, especially
's fluid, and take freely a solution of chlorate of potash or
Various antiseptics have been recommended internally,
as carbolic acid or sulphocarbolates, sulphites, and hypo-
tes. Should the case become chronic, tonics are needed,
od-liver oil, change of air, nutritious diet, and other meas-
r improving the health.

CHAPTER XII.

EMPHYSEMA OF THE LUNGS.

) primary forms of this affection are met with, named VE-
LR and INTERLOBULAR. In *vesicular emphysema* the air-
s are enlarged, either from excessive distension, destruction
r septa, or from both causes. This is the ordinary variety,
s a condition requiring full consideration. *Interlobular*
sema is characterized by the presence of air in the sub-
l and interlobular cellular tissue, usually the result of
e of vesicles. It is very rare, and will only call for a brief
.

VESICULAR EMPHYSEMA.

OLOGY AND PATHOLOGY.—Within the definition of this
l condition as above given, cases are comprised which differ
erably in their clinical aspects and importance. They
owever, be arranged in four groups, though these are fre-

quently more or less conjoined, viz.: 1. Acute emphysema, either general or local. 2. Chronic hypertrophous, or "large-lunged." 3. Chronic limited. 4. Atrophous, or "small-lunged." It will be convenient to consider first their etiology as a whole, and then indicate anything which applies to each individually. In the following remarks I have endeavored to give a condensed account of the main views expressed as to the modes of production of this disease.

Immediate, Direct, or Determining Causes.—1. *Inspiratory theory.* According to this view, emphysema is the result of *excessive or long-continued distension of the air-vesicles during inspiration.* Thus it is supposed that general emphysema may arise as the consequence of diminished expiratory force, such as occurs in old age, from loss of elasticity in the lungs and chest-walls, the inspiratory force remaining unimpaired. The result of this is, that the lungs are kept constantly distended, and they are more apt to become so, if inspiration is often performed vigorously. Again, when portions of the lungs are from any cause, such as pleuritic adhesions, collapse, or consolidation, rendered partially or entirely incapable of expansion, should the chest still enlarge to the usual degree during inspiration, the air which ought to enter these, passes into other parts, and stretches their vesicles unduly. This is named *vicarious emphysema.* Dr. C. J. B. Williams believes that in this way emphysema originates in bronchitis, the secretions or thickened mucous membrane obstructing some of the bronchi, and preventing air from entering the vesicles, while those *which are adjacent, where the tubes are free,* receive an excessive amount of air. On the other hand, Laennec's view was that *the vesicles terminating the obstructed bronchi* become themselves dilated, in consequence of air getting in during inspiration, which cannot be forced out during expiration, and hence the emphysema was named *substantive.* It has been argued against this theory, that expiration is a more powerful act than inspiration, to which it is replied, that a forced expiratory effort has very little influence in emptying the vesicles, especially if the smaller tubes are obstructed.

2. *Expiratory Theory.*—Sir William Jenner strongly advocates the theory, that emphysema is commonly the result of *violent*

expiratory efforts, with partial closure of the glottis, such as are carried on during coughing, lifting heavy weights, playing wind instruments, &c. There are certain parts of the lungs which are much less supported and compressed by the chest-walls and surrounding structures than others, and hence they yield under the above circumstances, and become distended. This is especially the case at the apices, the anterior margins, and around the bases, especially the left. The tendency to the production of emphysema in this way, is greater in proportion to the extent to which the lung is inflated; to the obstruction to the escape of air; to the force which is exercised in its attempted expulsion; and to the want of compression and support of the lung-tissue.

Niemeyer does not seem to lay much stress on the want of support in leading to emphysema from forcible expiration, but rather on the *direction of the force.* He says, "In all these acts (*i. e.*, coughing, straining, &c.) contraction of the chest is effected by vigorous upheaval of the diaphragm. The result is the expulsion of a strong current of air from the lower bronchi, the direction of which is obliquely upward, and, if the air be prevented from escaping through the larynx, a portion of it, in a compressed state, must be driven into the upper bronchi, whose direction is obliquely downward. By the centrifugal pressure exerted, by the air thus compressed, upon the vesicles of the upper lobes of the lung, and upon the adjacent thoracic wall, the latter become distended as far as it is possible for them to yield."

3. Some pathologists are of opinion that emphysema is due to *primary nutritive derangement of the walls of the air-vesicles.* Villemin describes a "hypertrophy of the elements of the vesicular membrane, causing an extension of this, and an increase in the capacity of the vesicles." As a *secondary result* of emphysema, nutritive changes in the walls of the vesicles are constantly seen; and should these be impaired in their resisting power, they are far more liable to become distended. Hence, in old persons, one attack of winter-cough will often set up a considerable amount of this disease, and when chronic bronchitis or congestion has existed for a length of time, the alterations in structure thus produced, render the vesicles much more capable of distension. *Atrophous emphysema* is the result of primary degeneration, in consequence

of which the partitions waste and disappear, throwing several vesicles into one; but, in other cases, degenerative changes must probably be rather looked upon as predisposing, or as "permanence-securing" causes of emphysema, as Sir W. Jenner terms them, than as "determining causes." What these morbid changes are, will be considered under the "anatomical characters."

4. Another theory, that of Freund, is, that in some cases a *primary chronic enlargement of the chest arises*, in consequence of hypertrophy and rigidity of the cartilages, and that the lungs become distended and emphysematous, in order to fill up the increased space. This must be a very exceptional cause.

No exclusive theory as to the mode of production of this disease can apply to all cases, and in many, doubtless, more than one of the causes mentioned has been at work.

Exciting Causes.—1. Emphysema is liable to occur in the course of many pulmonary affections, viz., *bronchitis*, especially chronic dry catarrh, consolidation or destruction of portions of the lung from any cause, collapse, extensive pleuritic adhesions or effusion, &c. 2. Hooping-cough is a common cause in children. 3. Croup, and other affections of the main wind-pipe, which give rise to obstruction, and produce much cough at the same time, are often followed by emphysema. 4. Cardiac diseases, which lead to permanent congestion of the pulmonary capillaries, materially aid in its production, by inducing degenerative changes in the walls of the vesicles. 5. Emphysema may be directly brought on by playing wind instruments, excessive effort, lifting heavy weights, straining at stool, climbing hills, &c.

Predisposing Causes.—Hereditary influence has been supposed to predispose to emphysema, especially in those cases in which it comes on early, but this is by no means certain. It is by far most common among persons advanced in years. Children, however, often suffer, in consequence of their liability to pulmonary affections, and the weakness of their chest-walls. Gouty and fat subjects are said to be predisposed.

It is necessary to say a few words as to the causation of the several forms of emphysema. What is termed *acute general emphysema*, which is common in extensive bronchitis, is due to a want of power in expelling the air, in consequence of the tion, which therefore accumulates, and inflates the lungs. bject to this condition being called emphysema, and they t *insufflation* or *inspiratory expansion*, because there is no disease, but merely an inflation of the lungs, which will , if the obstruction is speedily removed, but if not, per- ; emphysema will be established.

main difficulty is in determining the mode of production of *hypertrophous emphysema*, which follows chronic catarrh. garded by many as being *inspiratory* in its origin; but Sir ner considers it to be produced by *forcible expiration*, and s its *general distribution* by the fact that, as the lungs and nlarge, the relative position of the former to the ribs and stal spaces becomes constantly changed, so that successive s of the lung come to correspond to the spaces, and these less supported than the parts opposite the ribs, they are distended during cough, and thus ultimately the lungs more or less emphysematous throughout, but this con- s at the same time most marked in the apices and margins, are least supported.

lized emphysema, whether acute or chronic, is probably, as a roduced during expiration. In some cases it is inspiratory, ither *substantive* or *vicarious*.

lready stated, ordinary *atrophous emphysema* does not om distension, but from *wasting of the septa*, which become ated, so that the vesicles coalesce to a variable degree; in t is an *atrophy of the lung-tissue*, usually seen in old age, with other atrophic and degenerative changes.

TOMICAL CHARACTERS.—In *acute general emphysema* the re distended throughout, and do not collapse, or may even out when the chest is opened. The degree of expansion much. The lungs appear pale, the capillaries being ed, and their network enlarged. The bronchi will be to be obstructed.

mic hypertrophous emphysema also gives rise to enlarge- f the lungs, and on opening the thorax they are seen to beyond their ordinary limits, often covering the peri- n completely, and they may protrude, or collapse only very ectly. This will necessarily depend upon the extent of the disease. Though it is more or less general, the apices, anterior borders, and other parts least supported, present most evidences of it, as well as, usually, the surface. The emphysematous portions have a peculiar soft feel, compared to that of a "cushion of down," and retain the impression of the finger, elasticity being impaired. The so-called "crepitant" sensation of healthy lung is deficient or absent, and on cutting, a dull, creaking sound is often produced. The tissue is pale, bloodless, and dry, but presents irregular spots of black pigment, resulting from changes in the blood in obliterated capillaries. The vesicles are seen to be enlarged more or less, varying usually from a hemp-seed to a pea in size; but many of them are thrown into one often, so that irregular spaces of considerable size are produced, traversed by slender bands, the septa being visible as slight ridges, or having disappeared entirely. Contiguous lobules may freely communicate, and ultimately nothing be left but a coarse network. These appearances are best observed by inflating the lung, drying, and then making a section.

Much discussion has been carried on as to the nature of the changes in the alveolar walls, but there is no reason whatever to suppose that these should be identical in all cases. The violence of the pressure may rupture the septa and walls directly, but usually their destruction is gradual. They become stretched, atrophied, present perforations, varying in size and number, and ultimately only traces of them are seen, or they may disappear altogether. The structural alterations which have been described are the formation of an imperfect fibrous tissue, causing toughness and thickening, as the result of long-continued congestion (Jenner); or fatty degeneration (Rainey). Dr. Waters, of Liverpool, considers that there is a primary mal-nutrition of the pulmonary tissue, causing its degeneration, but the exact nature of this he has been unable to ascertain. The elastic and other elementary tissues disappear. The capillaries in the affected part become stretched, narrowed, obliterated, or some of them even rupture. Ultimately they are absorbed, and only pigment, the remains of the blood-coloring matter, is observed.

In the *limited* variety, the appearances are confined to certain parts, especially the apices and anterior and lower edges, being similar to those which are observed in the more extensive form.

In true *atrophous emphysema* the lungs are *diminished* in size, hrink into a very small bulk when the chest is opened, and are ery light. The divisions between the lobes are usually vertical. The pulmonary tissue is pale, but much pigmented, dry, and deicient in elasticity. The vesicles are enlarged, owing to atrophy f the septa.

Other morbid conditions are often seen in emphysematous lungs, uch as bronchitis, collapse in some parts, or, not uncommonly, ilated bronchi. Pleuritic adhesions generally exist. When the mphysema is extensive, the contiguous structures are displaced, nd after a time all the organs become the seat of congestion, and he changes resulting from this. Different statements have been made as to the position of the heart. My own observation would ead me to agree with those who describe it as lying with the ight border horizontally on the diaphragm, and the apex too uch down and to the left. Its right cavities become dilated nd hypertrophied in time.

SYMPTOMS.—It is only *chronic hypertrophous emphysema* which eads to any severe symptoms, and these are chiefly indirect. It nterferes with the due aeration of the blood, and the pulmonary irculation is obstructed from several causes, but especially on ccount of the destruction of the capillaries; this reacts on the ight side of the heart, causing its dilatation and hypertrophy, ith tricuspid regurgitation; then the general venous system beomes overloaded, and the various organs and tissues are in a tate of permanent congestion, which leads to dropsy and imporant organic changes. The lungs also are generally the seat of ronchial catarrh or other morbid conditions, and fits of spasmodic asthma, or acute attacks of bronchitis, are very liable to ccur.

Dyspnœa, variable in degree, is the main symptom directly due the emphysema. At first there is merely "shortness of breath" n exertion, especially on going up a hill, or after a full meal, ut, ultimately, persistent *expiratory* dyspnœa is present, though ot accompanied with much distress ordinarily, but rather a sense f discomfort and uneasiness. It is often relieved by pressing the sides, or lying on the abdomen. After a meal it is worse, especially if there is dyspepsia, and it is necessarily much aggravated if bronchitis or asthma should set in. The causes of the dyspnœa are, the great interference with the respiratory movements, from the depressed state of the diaphragm, and the rigid state of the chest-walls; the difficulty in expelling the residual air, and small amount of pure air inhaled; and the actual loss of surface fit for aerating the blood. *Cough* is generally present, but is chiefly the result of catarrh, when it is attended with expectoration, otherwise it is dry. As a rule there is no pain in the chest dependent upon the emphysema, but some think that it exists occasionally.

The other symptoms observed in connection with emphysema are *indirect*. Those due to interference with the circulation will be more conveniently described when considering heart diseases. As the result of the increased respiratory efforts, the muscles of respiration hypertrophy; hence the neck looks large. The fat is absorbed, causing emaciation, with strongly-marked features. The symptoms due to imperfect blood-aeration are similar to those already described, only more gradually produced, and there is a general apathy and languor, with a flabby and relaxed state of the muscles, from this cause.

The special features of acute bronchitis complicating emphysema have been pointed out previously. Asthma will be separately noticed.

PHYSICAL SIGNS.—These will necessarily differ much, according to the extent and variety of the emphysema and the morbid conditions with which it is associated. 1. *Shape and size of the chest.* In general "large-lunged" emphysema the chest is more or less enlarged throughout, or only in its upper or lower part. It may assume a permanent inspiratory form, or even go beyond this, becoming "barrel-shaped" and almost circular. There is often a rounding of the chest in front and of the back behind, but sometimes the change in shape is chiefly observed in one of these aspects. The ribs become more horizontal and the spaces wider in proportion to the enlargement, and the cartilages are frequently quite rigid. In localized emphysema there may be corresponding bulging. Atrophous emphysema is associated with a small chest, the ribs being very oblique, and the lower ones almost vertical.

2. *Respiratory movements.* Expansion is more or less deficient or absent, and there may be merely a general elevation of the chest. *Expiration is prolonged.* 3. *Percussion* reveals *increased area of pulmonary resonance*, except in atrophous emphysema, and generally *increased amount*, with fall in pitch, the sound approaching the tympanitic character, but being usually muffled. If the distension of the lungs is extreme, there is deficient resonance, with much resistance. 4. *Respiratory sounds.* The important character is the *great prolongation of the expiratory sound*, but this is not present in the atrophous variety. In pure emphysema the sounds are weak, but of harsh character. The extent over which they are heard is increased. 5. *A crepitant rhonchus*, already alluded to, is said to be sometimes heard. Râles due to catarrh, &c., are often present. 6. Vocal fremitus and resonance are quite unreliable. As a rule they seem to be deficient. They may be observed over a larger area than usual. 7. There are signs of *displacement of organs*, especially the heart. *Epigastric impulse* is common. 8. There are frequently evidences in the veins of obstruction to the circulation, but not in the atrophous form.

PROGNOSIS.—Emphysema is serious in proportion to its extent. It lays the foundation for a very miserable existence in many cases, increases the tendency to bronchial catarrh, and adds greatly to the danger from an acute attack of this. Once it is thoroughly established, it cannot be cured.

TREATMENT.—This part of the subject may be very briefly summed up, not because it is unimportant, but because it will only be necessary to mention the principles on which it must be conducted, the means for carrying these out being described in other parts of this work. 1. Every precaution must be taken against the occurrence of bronchial catarrh, not only on account of its danger, but because each attack tends to increase the emphysema. Other known causes of emphysema must be avoided. 2. It is very important to look to the state of the alimentary canal, as a deranged condition of this frequently increases the discomfort considerably. 3. The conditions associated with the emphysema must be attended to as they arise, especially asthma, cardiac diseases, congestion and its results, including dropsy, and the complications which occur in its course, particularly bronchitis.

Narcotics must only be used very cautiously. 4. It is often requisite to improve the general health and the condition of the blood by tonics, iron, &c., or to treat some constitutional diathesis, especially gout. 5. It is very questionable whether there is any *curative* remedy for emphysema. Degenerative changes may be checked by proper dieting. Strychnine, galvanism, breathing compressed air, and other remedies, have been said to produce some improvement.

A change of climate is often exceedingly beneficial in emphysema. Usually a mild climate, not too dry, suits best; but it is frequently a matter of personal experience as to which is most suitable. It has been recommended to spend the summer in pinewood regions, where there is a heavy fall of dew.

INTERLOBULAR OR INTERSTITIAL EMPHYSEMA.

ETIOLOGY.—This results usually from rupture of the air-vesicles, as a consequence of excessive pressure upon them, associated with forcible expiration, the glottis being much contracted. Thus it may follow violent cough, laughing, or effort during defecation or parturition. It is said to be not uncommon in croup, and to occur sometimes as the result of extensive collapse. Gangrene of the lung, or post-mortem decomposition, may cause air to be present in the interlobular tissue.

ANATOMICAL CHARACTERS.—Accumulations of air, varying in size, but generally small, are seen under the pleura, and they may form a border of minute vesicles around the lobules. The air can be displaced by pressure, in the course of the limits of the alveoli. Superficial collections occasionally give way, opening into the pleura and producing pneumothorax; or into the posterior mediastinum, leading to general subcutaneous emphysema.

SYMPTOMS.—The only symptom which might lead to the suspicion of this morbid state, is severe dyspnœa, following one of its causes. It is said a faint *friction-sound* is sometimes heard. Should there be pneumothorax or general emphysema, they would be indicated by the usual signs.

The only TREATMENT is to take every precaution to prevent the mischief from extending.

ASTHMA.

The use of this term is ambiguous, but it may be made to include all cases characterized by the occurrence of *severe paroxysmal attacks of dyspnœa.* The affection is considered in the present chapter, because it is often associated with emphysema. Four chief forms may be mentioned, viz.: 1. *Laryngeal.* 2. *Bronchial*, either *spasmodic* or *paralytic*, depending upon spasm or paralysis of the muscular fibres of the bronchial tubes. 3. *Hæmic*, due to an abnormal state of the blood or circulation. 4. *Diaphragmatic*, associated with spasm of the diaphragm and other respiratory muscles. Only the *bronchial* and *diaphragmatic* forms will be treated of here, *laryngeal asthma* having already been considered, and the *hæmic* variety will be noticed under cardiac diseases.

BRONCHIAL ASTHMA—SPASMODIC ASTHMA.

ETIOLOGY.—It is not improbable that, in some instances, there is a *paralytic* condition of the bronchial tubes, leading to asthmatic attacks. This may be the effect produced by certain poisonous gases, and by paralysis of the vagus nerve. Ordinarily, however, the paroxysms are *spasmodic* in their origin, being due to spasm of the muscular fibres, which is induced through the nerves, the irritation being either centric, direct, or reflex. The *causes* of this condition are as follows: 1. It may be *idiopathic* or *primary*, there being no obvious source of irritation, and it is then sometimes distinctly periodic. 2. *Direct inhalation* of various materials is a frequent cause, such as fog, smoke, different gases and vapors, dust, odoriferous emanations from animals, or from vegetable matters, especially *hay*, *ipecacuanha*, and certain flowers. The *conditions of the atmosphere* frequently influence the occurrence of asthmatic attacks materially, especially if it is excessively damp or dry, or if cold easterly winds prevail. Different asthmatic patients present remarkable peculiarities as to the qualities of the air which suits them best, but as a rule, a rather moist and relaxing atmosphere is least injurious, that of high and country districts is worse than that in low districts, or in large towns and cities. 3. Asthma is very commonly associated with bronchitis, bronchial irritation, or emphysema. 4. Cardiac diseases may induce *true spasmodic asthma*, by giving rise to pulmonary congestion. 5. Asthma may be gastric in its origin, following the taking of food more or less speedily. In some cases, any kind of food will bring on a fit, in others only indigestible articles, or special things, such as stimulants or sweets. Usually this form of asthma is looked upon as being due to reflex irritation; but Dr. Hyde Salter was of opinion that it generally depends upon an *offending condition of the blood*, brought about by the introduction of various matters, during digestion, into the circulation. 6. Various *reflex* sources of irritation may induce asthma, *e. g.*, uterine derangements, hardened fæces in the rectum, the sudden application of cold to the skin, cold feet, boils, &c. 7. Occasionally it is *centric* in its origin, as when it accompanies violent emotion or hysteria, or, vary rarely, organic disease about the roots of the vagus nerves. 8. Irritation of the pneumogastric nerves in their course, may, exceptionally be the cause of asthma.

Predisposing Causes.—A large number of cases commence within the first ten years of life, and they increase in frequency from 20 to (Salter). Men suffer much more than women. Hereditary predisposition appears to exist sometimes.

SYMPTOMS.—In some cases, *premonitory indications* of the approach of a fit occur, especially in connection with the nervous system. Occasionally there is an abundant discharge of pale, watery urine. There may be gradually increasing dyspnœa and other chest symptoms for a variable period before the actual attack. In many cases, however, this is quite sudden in its onset, coming on without any warning. It sets in, in the great majority of cases, early in the morning, from two to three o'clock, but meals, the recumbent position, effort, sleep, and other causes, may determine the time of its occurrence. In many instances, a distinctly periodic tendency is observed, which may be remarkably uniform, and either associated with some evident cause or not.

Characters of a Paroxysm.—The patient has an extreme sense of suffocation and want of breath, with tightness and oppression across the chest, loosens every article of clothing, and seizes upon every avenue for obtaining fresh air. The position assumed varies in different cases, the patient either sitting, standing, or kneeling, and fixing the bands or elbows on some support; many change their attitude frequently. Violent efforts are made to breathe, every muscle being called into action, the shoulders raised, and the head thrown back, with the mouth open, and consequently the sweat often pours off the upper part of the body. Th rate of breathing is frequently not increased, but inspiration is very shor abrupt, and jerky, expiration greatly prolonged, often terminating wi a sudden effort at expulsion, and being immediately followed by t inspiratory act. Respiration is noisy and wheezing. Soon there signs of overloading of the venous system, and non-aeration of the bl which may become very marked, the extremities being cold, and pulse small and quick, or sometimes irregular. The *duration* of struggle varies greatly in different cases, and it may go on for a time, with remissions or intermissions. The length of the fits is remarkably uniform in any particular case. The attack ends suddenly or gradually, this depending much upon its duratio whether it is allowed to run its course, or is checked by some po agent. Generally, a cough sets in towards the close, followed by amount of expectoration, in the form of little pearl-like gray pellets of mucus. In some cases it is considerable, and continues for some time, especially if the paroxysm is prolonged, and then the asthma is termed "humid." Occasionally hæmoptysis occurs, usually very slight, sometimes abundant.

The *physical signs* during a paroxysm are very characteristic, as evidencing constriction of the bronchial tubes, and interference with the passage of air. 1. The chest is frequently enlarged, the lungs being inflated. 2. Expansile movements are greatly deficient, or absent, and the intercostal spaces, suprasternal and supraclavicular fossæ, and epigastrium, sink in markedly during inspiration. The *rhythm* of the movements is altered, as already described. 3. Percussion-sound is extra resonant, and inspiration or expiration produces no effect upon it. 4. Auscultation discloses *feeble or absent breath-sounds* where the tubes are constricted; loud, puerile sounds where they are free; also *dry* râles in every conceivable variety. At the close, some moist râles may often be heard. Important characters as regard these auscultatory signs are, that they are frequently limited in their extent, and are constantly liable to change their place rapidly. By the sudden cessation of spasm, an exaggerated breath-sound may be heard, where a moment before there was none at all.

Usually both lungs are affected, but, occasionally, only, or chiefly, one of them, and then breathing is in excess on the unaffected side.

State of the Patient in the Intervals.—This will depend upon whether the asthma is due to organic disease or not. Immediately after an attack there is usually a feeling of exhaustion, with uncomfortable sensations about the chest; but when these pass off, patients generally feel relieved, and enjoy an immunity from further paroxysms for a time. As a case progresses, the fits tend to become more frequent, but less severe.

It is necessary briefly to allude to the variety named "hay-asthma," or "hay-fever." This is only observed in particular subjects, as the result of idiosyncrasy, and they suffer every hay season, often without any evident exposure to the exciting cause. The same effects may be produced by breathing the powder of ipecacuanha. The symptoms are those of coryza, bronchial irritation, with severe cough, short asthmatic attacks, especially at night, with much languor, and a sense of depression and want of energy, but no pyrexia. They set in speedily, and last a variable time.

Diagnosis.—Asthma is sufficiently characterized by the paroxysmal and usually sudden nature of the attacks; their peculiar characters, severity, duration, and often sudden termination; *the physical signs of temporary constriction of the bronchial tubes, but not of fluid in them;* the effects of treatment; and the complete or comparative absence of dyspnœa in the intervals. It has chiefly to be distinguished from emphysema, bronchitis, and cardiac dyspnœa, but it must be remembered that it may complicate these.

PROGNOSIS.—The immediate prognosis is favorable, death rarely occurring during a fit. The prognosis as to recovery is more hopeful in proportion to the youth of the patient; if the attacks only come on at long intervals, and are not severe or prolonged; if in the intervals the patient is well, and *there is no organic disease;* and if the paroxysms can be traced to some obvious cause, which may be avoided. The history of the progress of the case will give some aid.

TREATMENT.—1. *Prevention of an impending attack.* In these cases, where there are premonitory signs of a fit, it may be possible to stop it, by drinking strong coffee, removing every source of irritation, heating the body, or in some cases applying cold to the back, smoking stramonium or belladonna, and various other remedies.

2. *During the paroxysm.*—Any obvious exciting cause must be at once removed; thus a loaded stomach or rectum will require an emetic or enema; as much fresh, dry, warm air as possible must be obtained, and everything that can obstruct the breathing should be loosened. The position of the patient is to be studied; sitting or kneeling is usually the best, with the elbows supported, so as to raise the shoulders.

The remedies recommended for asthma are exceedingly numerous, chiefly belonging to the class of depressants, sedatives and antispasmodics, or stimulants. Different cases are relieved by totally different treatment, and at first it is quite an experiment as to what will suit best, but patients often learn by experience what gives them most speedy relief. The chief remedies employed internally are: depressing emetics and nauseants, especially ipecacuanha, or tartar emetic; tincture of belladonna, conium, hyoscyamus, datura stramonium, or tatula; opium or morphia; ether; tincture of lobelia (in gradually increasing doses, frequently repeated); cannabis indica; *strong hot coffee*, without milk or sugar, taken on an empty stomach; some spirit with *boiling* water in equal parts; or fragments of ice rapidly swallowed. *Inhalations* are most valuable, some of them being directly inspired, others being smoked, either in a pipe or cigarette. The most important remedies for direct inhalation are ether, chloroform, or a mixture of these; *nitrite of amyl*, which has been strongly recommended by Dr. Talfourd Jones of Brecon, but must be very cautiously employed; and the white fumes which arise from *ignited nitre-paper.* The principal substances smoked are tobacco, stramonium, belladonna, or a mixture of these, and great relief is often thus obtained, but of course great care must be exercised in conducting this mode of treatment. Subcutaneous injection of morphia is beneficial in some cases.

Various other measures have been recommended, such as applying cold or heat to the surface of the chest; ice to the spine; warm frictions;

turpentine fomentations; sinapisms to various parts; putting the hands and arms into warm water; a warm foot-bath with mustard in it, cold water being drunk at the same time; a weak galvanic current along the course of the vagus nerves, &c.

3. *During the intervals.*—At this time the main points to attend to are—to study the *locality* which suits the patient best, as regards the condition of the air, &c.; to pay strict attention to the state of the alimentary canal, and to the diet, as well as to the condition of the functions generally; and to *avoid everything which is known to produce an attack of asthma.* In many cases the habitual use of some of the remedies already mentioned may ward off the fits, such as tobacco or stramonium smoking, inhalation of the fumes of nitre-paper or chloroform. If any organic disease is present this must be treated accordingly. A course of quinine, strychnine, or some metallic tonic, is very serviceable in many cases. Galvanism or counter-irritation along the vagus nerves, the inhalation of compressed air, and other measures have been suggested.

With regard to hay-asthma, it is necessary to avoid the cause of this, and the seaside seems to offer the best protection, or, if possible, a voyage should be taken. During the attack small doses of hydrocyanic acid, with tincture of lobelia, or other antispasmodics, may be given at frequent intervals. Weak inhalations of creasote or chlorine have been recommended. As preventive measures, quinine and iron, arsenic, nux vomica or strychnine, and other tonics, might be tried, with cold bathing. The systematic inhalation of a few drops of chloroform has been found useful by Dr. Reynolds.

Diaphragmatic Asthma.

A form of asthma has been described, supposed to be due to spasm of the diaphragm, and other muscles of respiration, and having the following characters. The respirations are diminished in number, and the difficulty is limited to expiration, which is greatly prolonged, inspiration being short and abrupt, while but little air enters the lungs. The abdominal muscles become rigid and hard, and may cause expulsion of the urine and fæces. There is much distress, and signs of imminent suffocation may appear. If the spasm subsides there is no cough or expectoration. *Physical examination* reveals distension of the lungs, undiminished during expiration. There are *no dry râles*, such as are heard in spasmodic bronchial asthma. I have seen symptoms very similar to those described, coming on in connection with an immoderate fit of laughter.

CHAPTER XIII.

ATELECTASIS—APNEUMATOSIS—PULMONARY CO LAPSE—PULMONARY COMPRESSION—CARNI CATION.

THESE terms all signify conditions in which the lungs are, t greater or less extent, merely devoid of air, so that the affected portions are useless for respiratory purposes. *Atelectasis* strictl refers only to lungs more or less in their fœtal condition, not hav ing expanded properly. The other terms indicate a return to *this* condition, either from *collapse*, in consequence of air being prevented from entering the vesicles through the bronchi, or as *the* result of external *compression* of the lung.

ETIOLOGY.—1. *Collapse.* The results of experiment and observation show, that the ultimate effect of complete and continued obstruction or narrowing of a bronchial tube from any cause, is *collapse* of the vesicles which it supplies. The explanation of this is as follows: The bronchi become smaller as they divide, and the air drawn in during *inspiration* drives on any obstructing material, so that at last it reaches a point where it produces complete closure, and thus no air can enter the vesicles. Durin *expiration* it is forced out to some extent, and a certain quanti of air escapes, but it again returns with inspiration, acting in f like a "ball-valve." Thus, as no new air enters the vesicles, that previously present is gradually expelled, they finally coll entirely. It is supposed also that some of the air may be absor In the great majority of cases the obstruction is associated bronchitis, either simple, or in connection with measles, hoo cough, croup, &c., especially if its products are very tenacio viscid, but they need not be of this character. Infants a tremely prone to suffer from collapse, and it is especially fr during the first year of life, and in children who are ill-no or rickety. Among other predisposing causes are a yield dition of the chest-walls, and a weak state of the muscles; i to cough and expectorate; distension of, or pressure upo domen, preventing the movements of the diaphragm; and the previous existence of atelectasis.

When pressure is exerted on a main bronchus, as by a tumor, the whole lung may ultimately become collapsed.

2. The chief causes of direct *compression* of the lung are, *pleuritic accumulations of fluid or air, or agglutinations;* great pericardial effusion or cardiac enlargement; intrathoracic tumors or aneurisms; deformities of the thorax; and excessive abdominal enlargement, from ascites, ovarian tumors, enlarged liver or spleen, hydatids, &c.

Anatomical Characters.—The appearances *in atelectasis* and *collapse* are very similar. Usually *distinct lobules* are involved, scattered through different parts of the lungs. The margin of the bases, the tongue-like prolongation of the left upper lobe, and the middle lobe of the right lung, present the collapsed lobules most frequently, and next the back of the upper and lower lobes on both sides. Superficial lobules are much more commonly affected than those which are deep.

The characters will vary according to the time the collapse has existed, and the amount and condition of the blood in the affected lobules. At first there is congestion, but soon the blood coagulates in the vessels, and then undergoes changes, becoming decolorized, firm and contracted, the vessels being finally obliterated. The walls of the alveoli after a time adhere together, and catarrhal pneumonia is frequently set up. As seen on the surface of the lung, the collapsed portions have a well-defined outline, and are usually sunk below the surrounding level, but not always. Their size depends upon that of the bronchus obstructed. The color varies considerably, ranging from deep-purple to light-red, but being usually dark-red, or of a somewhat violet hue. Whitish streaks are evident on close examination, indicating the divisions into smaller lobules. A section is quite smooth, but varies in color, and it shows the collapsed part to be somewhat pyramidal in shape, with the base outwards. This is quite airless and non-crepitant, usually of a tough and firm consistence, and when situated in a thin margin, may be felt between the finger and thumb. Pieces sink in water. *The affected lobules can usually be inflated to a greater or less degree by* *means of a blowpipe introduced into the communicating bronchus*, and they then enlarge, assume a light-red color, and come to resemble normal lung-tissue, but they soon subside, unless the bronchus is tied. In proportion to the degree of congestion, will be the depth of color, bulk, firmness, and difficulty of inflating the collapsed portions. In course of time they become paler, looser, but tough in texture, and cannot be expanded, as the walls of the vesicles adhere. The tubes proceeding to them will usually be found to contain some obstructing secretion. Other parts are frequently the seat of emphysema.

Compression expels the air and blood from the lungs to a variable degree, and the appearances differ accordingly. When only the air is driven out, the blood remaining, the lung-tissue is dark-red, moist, but very firm and dense, and this is the condition known as "carnification." Finally it becomes gray, anæmic, but pigmented, dry, of a tough, leathery consistence, and incapable of insufflation.

SYMPTOMS.—*Dyspnœa, with quick and shallow breathing, feeble and ineffectual cough, signs of deficient blood-aeration*, and *great wasting and exhaustion*, are the phenomena attending pulmonary collapse, their severity being necessarily in proportion to the extent of the mischief and the rapidity with which it is set up. Death is a very frequent termination in children, and may take place speedily or gradually. The *physical signs* are: 1. Those of *inspiratory dyspnœa*, the chest falling in more or less. 2. Dulness over the affected parts. 3. Weak or bronchial breath-sounds. In many cases, however, there are no physical signs whatever, and they may be obscured by emphysema, bronchitis, and other morbid conditions.

Considerable compression may exist without any symptoms, if it is produced gradually. In this condition a few *dry, crepitant râles* may sometimes be heard at the close of a deep inspiration (*compression-rhonchus*), and the heart is often too much uncovered.

PROGNOSIS.—Extensive collapse is exceedingly dangerous in children, especially if very young, feeble, and placed under bad hygienic conditions; it adds greatly to the fatality of bronchitis, hooping-cough, measles, croup, &c.

TREATMENT.—When collapse is suspected during bronchitis in children, the main objects are to assist the efforts at breathing, and the discharge of the obstructing secretion. Friction with oil over the chest, as recommended by Dr. Graily Hewitt; artificial respiration; the application of sinapisms; an emetic of sulphate of zinc or ipecacuanha; and the administration of expectorants, are the chief measures which are of use. A warm bath is of service occasionally. The diet must be carefully attended to, and much support is often required, it being adapted to the age of the patient; stimulants are also frequently useful. If there are signs of apnœa, the warm bath with the cold douche should be tried. As regards compression, the removal of its cause is the main object.

CHAPTER XIV.

PHTHISIS—PULMONARY CONSUMPTION.

UNDER this term unquestionably, several distinct affections are included, all of which, however, tend to produce similar results, viz., consolidation, followed by destruction of the lung-texture, and wasting of the blood and tissues of the body. The subject is one which it is very difficult to treat in a brief article like the present, not only on account of its extent, but of the numerous and diverse opinions which are held at the present day with regard to it. Merely an outline can be given, the object being to present a concise account of the main facts, and of the principal views entertained, more especially as regards the pathology of the disease.

ETIOLOGY.—*Hereditary or family predisposition.* There can be no doubt as to the existence of an inherited tendency to phthisis, but the proportion of cases in which this is apparent has been very differently stated by different observers. Further, many consider that a *specific diathesis* is thus transmitted, whereas others believe that it is merely a *constitutional debility*, and that this may be present in children born of parents in a bad state of health from any cause, as well as in those derived from consumptive parents. Dr. C. T. Williams gives the following conclusions on this subject: 1. Family predisposition occurs more commonly among, and exercises a more decided influence on, females than males; and the former have a greater power of transmission than the latter. 2. Fathers transmit more frequently to sons, and mothers to daughters, than the converse. 3. Family predisposition does not directly shorten the duration of the disease. 4. It precipitates the onset of the disease, and thus shortens the duration of life. *Age.* Most cases are met with from twenty to thirty. The disease is not often observed during early childhood, or in advanced age, but may exist at any period of life. It is more rapid usually in the young. *Constitutional condition.* Persons who are feeble and delicate are most liable to be affected. *Occupation.* Phthisis is very common among those whose employment exposes them to various irritant inhalations, to causes of cold, or to the influence of improper hygienic conditions, to be presently mentioned. *Habits.* Sedentary habits and want of exercise, intemperance, masturbation, excessive sexual indulgence, and debauchery generally, are the chief causes of phthisis coming under this head. *Diet and digestion.* The mal-nutrition resulting from an imperfect supply of nutriment to the system, from any cause, has a powerful influence in producing phthisis, especially in the young. This may be associated with an insufficient amount or improper quality of the food, or with a want of power of assimilation, on account of dyspepsia and various diseases interfering with digestion. Some have laid great stress on a *deficiency of fat* in the system as a cause of phthisis, either from its not being supplied, or because it cannot be digested, and Dr. Dobell has attributed this to a disturbance of the functions of the pancreas, its secretion being consequently diminished. *Interference with respiratory functions.* The want of ventilation and fresh air, and constant breathing of an impure atmosphere, materially assists in the production of phthisis; hence it is so common among those whose occupation compels them to remain in a close, confined room for many hours during the day, and often during the night, such as seamstresses, tailors, &c. It is also frequent in ill-ventilated places, where many persons are gathered together, especially children, *e. g.*, orphan-asylums, prisons, &c. Whether interference with the respiratory movements, from pressure of stays or position, has any effect in the production of phthisis, is a matter of dispute. Dr. McCormac attaches great importance to "rebreathed air" as a cause of consumption. *Climate and locality.* Dampness of soil and abundant moisture in the atmosphere have been proved to be powerful predisposing causes of phthisis. It is most prevalent in those climates characterized by *rapid changes of temperature* or prolonged *cold with damp.* The true tubercular form is said to be favored by a high temperature. Elevated regions are remarkably free from phthisis, while those which are low present a large number of cases. It has been stated that malarial districts are comparatively free from the disease. *Mental causes.* Severe mental depression, from anxiety, grief, overstudy, &c., certainly seems to have considerable influence in some cases. Phthisis is not at all uncommon among the inmates of lunatic asylums. *Previous and existing diseases.* Phthisis may follow measles, hooping-cough, croup, typhus, typhoid, scarlatina, and other acute diseases. Repeated attacks of bronchitis greatly favor its occurrence, and it may result from pneumonia, especially catarrhal, pleurisy, and possibly laryngitis. Under this head may be mentioned miscarriages, bad confinements, prolonged lactation, and the suppression of discharges, all of which certainly increase the tendency to consumption. It occurs often during the course of diabetes, and in diseases of the alimentary canal and other parts, which interfere with the taking or assimilation of food. With regard to the anæmic or chlorotic condition, so frequently observed in young females, as Dr. Pollock has remarked, those who are in this state seem to be peculiarly free from phthisis, but it does sometimes occur in such subjects, and may come on very insidiously. *Infection.* It has been imagined that consumption is capable of transmission by infection through the breath, but the evidence of such a mode of origin is extremely unsatisfactory.

Such are the principal causes which may lead to phthisis. It is not practicable to divide them into *predisposing* and *exciting*, as most of them may, under different circumstances, belong to either class. If they are studied, it will be observed that they may be separated into two groups, as regards their mode of action, the one tending to produce a low, unhealthy state of the constitution, the other to cause local irritation in connection with the pulmonary organs. In the great majority of cases, several causes have been at work, and often there is a combination of both sets. With regard to the immediate origin of phthisis, it may or may not be traced to some definite *exciting cause*, such as a cold, or any other source of irritation which might give rise to congestion of the lungs or bronchitis. This part of the subject will call for further notice, under the pathology of the disease, which is next to be considered.

PATHOLOGY.—Until within the last few years, phthisis was almost universally looked upon as essentially a *tubercular* disease, depending upon the deposit, and ultimate breaking down of tubercle in the lungs, causing destruction of tissues, with the formation of cavities. The importance of inflammatory processes in the production of this disease had been recognized by a few observers, such as Addison, Williams, &c., but it is only comparatively recently that they have been assigned the prominent position which they now occupy with many pathologists, especially through the advocacy of Niemeyer. There is a very wide difference of opinion, however, upon this subject at the present day. Undoubtedly all cases of phthisis do not originate in the same manner, and in the following remarks it is proposed to indicate the various modes in which the consumptive processes might arise, in accordance with the different views held. Dr. Williams applies the term "phthinoplasm" to the various materials, from the decay of which the consumptive destruction of the lungs results, and adopting this term, the "phthinoplasms" may be divided into: 1. *Inflammatory.* 2. *New growths or deposits.*

1. *Inflammatory.*—(i.) A comparatively few cases of phthisis result directly from an attack of *acute croupous pneumonia*, especially if this is in the apex of the lung, the inflammatory products instead of being absorbed, undergoing caseation, ultimately breaking down, and giving rise to disintegration of the pulmonary tissue. It has been suggested by Dr. Williams, that a *continued high temperature* and other agencies may have the effect of *hardening* the cells in the exudation, lowering their vitality, and preventing their development or removal.

(ii.) *Catarrhal pneumonia*, either *acute* or *chronic*, is the variety of lung-inflammation to which Niemeyer has attributed the origin of the large majority of cases of phthisis, and he believed that this might arise under the following circumstances: a. *As the result of extension of a simple acute or chronic bronchitis from cold, into the air-vesicles.* He was of opinion that this might occur in a person constitutionally strong, but is more liable to happen in the case of those who are debilitated, and in a low state of vitality, and that the products are, in such subjects, more likely to undergo the destructive processes to be presently mentioned. Most cases of *acute or galloping consumption* were attributed by him to *catarrhal pneumonia*, complicating *extensive acute bronchitis*. *b. From inflammation set up in collapsed lobules associated with bronchial catarrh, e. g.*, after measles, hooping-cough, &c. *c. By extension of inflammation due to the inhalation of irritant particles, in various occupations, into the air-vesicles. d. As the consequence of the irritation of blood, poured out into the bronchial tubes, which has not been expectorated, but has remained, become coagulated, and set up inflammation.* This opinion has been strongly contested by many observers, who regard hæmoptysis as a *sign of the previous existence* of pulmonary disease, and *not as a cause* of this.

The explanation of the changes, as described by Niemeyer, is this: Cells, the products of inflammation, accumulate in the alveoli and minute bronchi, crowd upon each other, becoming densely packed, and thus, by their mutual pressure, they bring about their own decay, as well as that of the lung-textures, by interfering with their nutrition, the alveolar walls being also themselves damaged by the inflammatory process. They therefore become caseous, and may undergo calcification or absorption, or be ultimately discharged, giving rise to cavities.

Different observers have described *special forms* of pneumonia as leading to phthisis, which they designate albuminous, scrofulous, tubercular, caseous, &c.; but Niemeyer denies that the inflammation has ever any specific characters, but that all varieties may end in caseous degeneration, and consequent phthisis.

(iii.) *Chronic interstitial pneumonia* leads to destruction of the lung, and, as already mentioned, this disease is termed "fibroid phthisis." It occurs, to a greater or less extent, in most phthisical lungs.

2. The usual form of phthinoplasm coming under the class of *new growths or deposits* is *tubercle.* It will be needless to enter again upon the various points connected with the pathology of this morbid product, but the subject will only be considered in its relation to the lungs. Niemeyer held that *primary tubercular phthisis* is rare, and that when tubercle is found in these organs, which *in many cases of consumption it is not,* it is, as a rule, *secondary to caseous degeneration of some inflammatory products,* being formed chiefly in the neighborhood of these; or, should it be *primary,* some cheesy masses will be found in other parts of the body. He considered that acute deposit of tubercle in the lungs is more likely to occur as a primary event than chronic; that primary tuberculosis is observed with greater relative frequency in those who are predisposed to inflammation ending in caseous degeneration; that the greatest danger for most consumptives is their liability to become tuberculous; and that though tubercle may give rise to pneumonia, this is far less extensive than when the inflammation is the original mischief.

On the other hand, many eminent authorities will not accept these views, but hold that the *formation of tubercle is the first step in the consumptive process* in most cases, and that this undergoes degenerative changes, at the same time by its irritation causing inflammation; in short, *that, as a rule, phthisis is essentially a constitutional, tubercular disease.*

It cannot be doubted but that many of the morbid conditions described as *tuberculous infiltration, gelatinous infiltration,* &c., are not associated with tubercle at all, but are inflammatory in their origin.

Under the class of *new growths* may also be mentioned those rare cases of destruction of lung, which are apparently associated with the breaking-down of *syphilitic gummata.*

Having thus considered the *etiology* and *pathology* of phthisis generally, it will be expedient in the subsequent treatment of the subject to give a separate account of the disease, as it occurs in its *acute* and *chronic* forms.

ANATOMICAL CHARACTERS.—Rarely the post-mortem examination merely reveals the remains of an *acute croupous pneumonia*, which has ended in destruction of the lung-tissue.

ACUTE PHTHISIS—GALLOPING CONSUMPTION.

In more cases there are evidences of *extensive bronchitis*, with *catarrhal pneumonia*, which may invade large tracts of lung-tissue, the products being soft and caseous, easily breaking down, or irregular cavities of various sizes having formed here and there. The lower lobes are usually most involved. There are signs of pleurisy to a variable extent. In other instances the pulmonary affection is but a part of *acute tuberculosis*, the lungs, along with other organs, being studded throughout with *gray miliary tubercles*, much congested, especially in dependent parts, but not inflamed. In this form caseous masses will be found usually either in the lungs or elsewhere.

SYMPTOMS.—The clinical history of acute phthisis is that of a febrile disease, with severe pulmonary symptoms, and, as a rule, signs of consolidation and destruction of the lungs. It may attack a person previously healthy to all appearance, but this is not usually the case. Hæmoptysis is sometimes the first symptom. The course is in some instances extremely rapid and virulent, but any case of phthisis ending within a few months would be considered acute.

When acute phthisis follows croupous pneumonia, it is indicated by a continuance of the chest symptoms and fever, with abundant perspirations and wasting, the *physical signs* showing persistence of the consolidation, followed by softening, and the production of excavations. When it is associated with bronchitis and catarrhal pneumonia, the local symptoms are pains about the chest, considerable dyspnœa, frequent cough, and abundant expectoration, which may be "rusty." There is considerable pyrexia, especially at night, with much sweating, and often rigors, rapid wasting, and great debility. *Physical signs* at first reveal merely bronchitis. Afterwards there will be indications of consolidation, softening, or excavations in various parts, often most marked towards the bases, viz., dulness, bronchial or hollow breath-sounds, crackling, followed by large, moist, often ringing râles, and increased vocal fremitus and resonance. Pleuritic friction-sound is also frequently heard.

In the acute tuberculous form the symptoms are those of very high fever, intense prostration and adynamia, as described under acute tuberculosis, with extremely hurried breathing, and cough, but *no marked physical signs*, there being only râles, significant of pulmonary catarrh, and subsequently of œdema. There may be signs of tubercle in other parts.

DIAGNOSIS.—This subject will be again considered; at present it is only necessary to mention that care must be taken to avoid confounding acute phthisis with certain specific fevers.

TREATMENT.—According to the nature of the case the treatment of acute phthisis will either be that of ordinary pneumonia, extensive catarrh with catarrhal pneumonia, or of acute tuberculosis. Lowering measures are not borne, but a supporting and stimulating plan of treatment is indicated. If there is high fever, full doses of quinine may be given, or the application of cold cautiously tried. Various symptoms, such as pain, cough, dyspnœa, hæmoptysis, sickness, &c., often need attention. Local applications to the chest, in the form of poultices, sinapisms, turpentine fomentations, or blisters, are frequently serviceable.

CHRONIC PHTHISIS.

ANATOMICAL CHARACTERS.—The appearances observed in the lungs in chronic consumption vary greatly in different cases, according tq the nature of the destructive process, the changes which have taken place during its progress, and the other morbid conditions with which it is associated. As a rule, but *not always*, the disease is most extensive and advanced at the apices, which at first *are solely* affected, the entire upper lobes becoming afterwards involved from above down, and subsequently the lower, so that the disease is seen at various stages, often retrograding in one part while extending at another, while it may be of a different nature in different portions of the lungs. In persons who die of phthisis, both lungs are usually implicated to a greater or less extent, though not equally. The disease, however, may be limited to one lung, or even a small part of it, and may undergo curative changes, when the patient dies from some other cause, evidences of pulmonary disease are observed.

primary morbid condition in the progress of phthisis is *lation* of some kind. This may originally present the ters of the ordinary gray hepatization of pneumonia, but very exceptional cases; of, usually, a gelatinous-looking tion, grayish, homogeneous, and smooth on section, at first to lobules, but afterwards involving the pulmonary tissue vely, and supposed to be due to *catarrhal pneumonia* or *ted tubercle,* according to the view entertained with regard athology; or of gray miliary tubercles, either separate, or, ommonly, in groups. The formation of true tubercle is ly, in the large majority of cases, a *secondary process,* but *primary,* and it is produced either in the perivascular s, in the walls of the vesicles, in the mucous membrane of nchi, or in the adenoid tissue near these.

tendency in all these morbid products is to undergo on and disintegration, either rapidly or gradually, and to a le degree and extent. As a result, considerable alterations ct and other characters are observed. The affected parts yellow, opaque, and soft, and give rise to the appearances ly considered characteristic of yellow tubercle. When les become caseous, to which change they are very liable, ellow nodules are seen, but these are frequently simulated ction of a bronchial division, or of alveoli, inclosing caseous . There is no doubt but that complete liquefaction may lace ultimately, followed by absorption or expectoration overy. Frequently calcification ensues, and hard calcareous s or masses remain in the lungs. The further course of s, however, is characterized ordinarily by the continued ng of the morbid materials, which are finally discharged h the bronchi, and expectorated, *cavities, excavations,* or being thus originated in the lungs. These vary greatly nber, form, size, and other characters. Often they are e extent, in consequence of continued enlargement and ence, or several may communicate together in an anfrac- manner. They increase by an infiltration of the walls, become caseous and disintegrate; or by the formation and destruction of secondary tubercle. Their walls are irregul at first, and they contain generally a purulent-looking substanc or sometimes a dirty, thin, and fetid liquid. A variable numb of bronchi are seen opening abruptly into a cavity, either direct or slantingly, and presenting circular or oval orifices. Obliterate branches of the pulmonary artery may be observed on the wall or passing across the cavity, but sometimes they are not close and may be the seat of small aneurismal dilatation or "ectasias thus greatly increasing the liability to fatal hemorrhage. Obliterated bronchi and thickened fibrous bands also traverse the space. Niemeyer was of opinion that most of the cavities seen in phthisical lungs are due to dilated bronchi, but it is impossible to agree with this statement.

An important secondary process, set up in most cases of phthisis, is that associated with *chronic interstitial pneumonia,* which materially aids in arresting and repairing the mischief produced by the disease. This arises in the neighborhood of consolidations and caseous substances, sometimes forming dense capsules for them, or indurated masses, and also around cavities. The latter after a time tend to become smooth, and apparently lined by a membrane, should the consumptive process cease; afterwards they may gradually contract, and, finally, close up, leaving only an indurated, puckered cicatrix. In some very chronic cases of phthisis the lungs may present nothing but fibroid induration, with cavities in various stages of contraction. It must be remembered that this last condition originates in a different manner from that associated with ordinary "fibroid phthisis."

In addition to the diverse appearances in the lungs, owing to the combination of conditions already described, these are generally further modified by the presence of bronchitis, often with ulceration of the mucous membrane, dilated bronchi, emphysematous patches, collapse, extravasations of blood, or recent pneumonia. Pleuritic adhesions and thickenings always exist, especially at the apices, where there is often a dense, fibrous cap, half an inch or more in thickness. In these adhesions new vessels form by extension from the intercostals, and thus a communication is formed between these and the vessels of the lungs.

Other structures besides the lungs are generally involved in phthisis, as will be pointed out when considering the *complications*, but the morbid appearances do not need any description here, as this is given in other parts of this work.

SYMPTOMS.—Phthisis presents considerable variations in its clinical history, both as regards its mode of onset and its subsequent course, but the symptoms bear a general resemblance in the different cases. The disease may commence quite suddenly, as by an attack of hæmoptysis; or may remain after some acute affection; or may come on acutely, afterwards subsiding into a chronic stage; or may set in gradually and insidiously. In the latter case the *pulmonary symptoms* are first observed in some instances, especially those indicating chronic bronchial catarrh; in others *signs of constitutional disturbance* or *derangement of the digestive organs.* The symptoms will be treated of as *local* and *general.*

Local.—Pains in the chest and sides are common, though not usually severe. They seem generally to be either pleuritic or muscular, the latter occurring often as the consequence of cough. *Dyspnœa* is frequently present more or less, from various causes, but may be entirely absent. Respirations are often increased in number, rising somewhat towards evening. Shortness of breath on exertion is very commonly complained of. Of course, when the lungs are extensively diseased, breathing is much affected. *Cough* is an essential symptom, and may, for some time, be the only one. In its severity and characters it differs greatly, and that by no means according to the extent of disease. At first it is often dry and hacking. *An unhealthy condition of the throat* or *larynx* not unfrequently gives rise to it, in the latter case it being generally of hoarse quality. It is usually worse on first lying down at night, after sleep, and after meals. A paroxysm is often *terminated by vomiting,* especially when food has been taken. *Expectoration* soon occurs in most cases, the greater portion of the sputa arising, as a rule, from bronchitis. Their characters and amount alter during the course of a case, and they present much variety in these respects. At first they consist merely of clear mucus, or sometimes small, opaque pellets are discharged; subsequently they become muco-purulent, and when cavities form, irregular, opaque, airless masses are expectorated, more or less greenish-yellow, which sink in water, and which, when discharged on to a flat surface, spread out to resemble a coin, hence named "nummulated." This form of sputum is not characteristic of cavities, however, as it may be observed in mere bronchitis. The masses are mingled with more or less bronchial mucus. In some cases mere pus is expectorated, and occasionally a quantity of it is suddenly discharged, owing to the opening of a cavity. The sputa often have an unpleasant odor, and may be extremely offensive, but this is not common. In favorable cases, even when large cavities are present, expectoration diminishes, and may ultimately cease altogether. Examination of the sputa may reveal caseous or calcareous particles. *Microscopic examination* discloses epithelium; abundant, newly-formed, granular, and pus-cells; blood-corpuscles; numerous fat-granules and oil-globules; calcareous granules; vegetable growths not uncommonly; it is said tubercle-cells (?); and, in some instances, *fragments of lung-tissues, especially elastic fibres*, the last being a sign of great importance. Sugar may be detected chemically.

Hæmoptysis requires special notice. It is observed to a greater or less degree, in the great majority of cases of phthisis, varying, however, widely as regards the amount and exact characters of the blood discharged, and the frequency of its occurrence. It may range from mere streaks in the sputa to a quantity sufficient to prove immediately fatal, but death directly due to hæmoptysis is not a common event in phthisis. When blood is intimately mixed with muco-purulent matter, it has been stated to be pathognomonic of chronic pneumonia. The hæmoptysis is frequently, but not necessarily, brought on by some exciting cause, such as violent cough. In certain cases it tends to be repeated, and may be almost periodic. When not abundant, it seems to give a patient relief sometimes, but usually the result of hæmoptysis, if in any quantity, or if repeated, is to induce debility and anæmia, or it may increase the local mischief.

It is believed by some authorities that the blood generally comes from the *bronchial* capillaries, but probably the *pulmonary* vessels are the usual source. These have been supposed to be in

of *fatty degeneration*, and, as already remarked, consider-
anches may remain unobliterated, or be the seat of *ectasias*,
their rupture give rise to fatal hemorrhage.

ral.—Pyrexia is a very important symptom in phthisis,
e *which should always be looked for, by the systematic use of*
mometer. This instrument is particularly important in
ng an early stage of the disease, and indicating its degree
vity. It has been also stated to aid in determining the
of the destructive process, *tubercular phthisis* being char-
ed by a *more continuous fever* than the other forms. This
n, however, needs further observation. As a rule, marked
ariations in temperature are observed, and it increases
rably in the evenings. Towards the close of many cases
hisis, *hectic fever*, in its most typical characters, is present.
weats are complained of in the large majority of cases.
tend to come on especially towards early morning, but not
uently they set in as soon as the patient falls asleep, and
so excessive as to saturate the bedclothes, causing much
and exhaustion. *Loss of flesh* is another prominent
m, being dependent chiefly on the pyrexia. This must be
ined by *frequent weighing*, and no reliance ought to be
on the mere statement of the patient. The emaciation is
xtreme, and it is a matter of common observation that it
e marked about the body and limbs, and especially the
han the face. The fat disappears, and the musless feel
and wanting in tonicity. The chest-muscles are often
ritable on percussion. More or less *anœmia* is usually
d, the patient being pale, and there may be œdema of the
m this cause. At first, the blood is generally hyperinotic,
n it deteriorates in quality. In advanced cases the skin
ently dry and scaly. Among other external appearances
may be noticed are chloasma over the chest, grayness of
r here, lankiness and falling off of the hair generally, bul-

The *digestive organs* are generally out of order. Loss of appetite, thirst, and dyspeptic symptoms are often present. Not uncommonly the mouth, tongue, and throat are red and irritable, with signs of subacute gastritis. In some instances the stomach is extremely irritable, retching and vomiting being immediately excited when anything is taken. The breath has, in not a few cases, a very peculiar odor, which has appeared to me to be quite characteristic. At the close, thrush is not infrequent. It has been stated that phthisical patients have a peculiar dislike to, and difficulty in the digestion of, fatty substances. Constipation is the rule at first, but later on there is a great tendency to diarrhœa. A red line along the gums, and transverse cracking of the teeth, have been described in phthisis, but they are frequently absent, and are not characteristic.

Consumptive patients are inclined to be irritable and fretful. As a rule, they are remarkably hopeful, and, even when near the end, cannot realize their condition, but imagine they will recover.

The *urine* is, in the early stage, more or less febrile, and contains excess of products of tissue-destruction. Finally, it is watery, and deficient in solids. Albumen or sugar may be present. The *menstrual functions* in females are often imperfectly performed.

Numerous symptoms which occur in the course of phthisis are dependent upon the *complications* so often met with, some of which are due to tubercle in other parts. The chief of these are: affections of the larynx and trachea, especially ulceration; bronchitis, pneumonia, or pleurisy; perforation of the pleura, with pneumothorax; enlargement of the external absorbent glands, or of those in the chest and abdomen; tubercular peritonitis; ulceration of the intestines, especially the ileum; fatty or amyloid liver; fistula in ano; various forms of Bright's disease; diabetes; pyelitis; tubercular meningitis, or tubercle in the brain; thrombosis of the veins of the leg.

The *course* and *duration* of a case of phthisis are subject to much variety. The disease may progress steadily from bad to worse, either rapidly or gradually, but more commonly there are intervals of improvement and exacerbation. Some cases remain apparently in the same state for a long time, while others, even when far advanced, improve and may ultimately become practically cured. It is quite astonishing in some cases, what a length of time patients will remain alive, when apparently in a moribund condition.

Death may take place by gradual asthenia and hectic fever; occasionally from hæmoptysis; from some of the complications mentioned, which generally aid in the fatal result; or from some intercurrent attack.

PHYSICAL SIGNS.—The *physical signs* which may be associated with phthisis are due to: 1. Primary consolidations. 2. Softening of these. 3. Cavities formed in the lungs. 4. Secondary consolidation from interstitial pneumonia, which tends to produce much induration, and shrinking of lung-tissue. 5. Other pulmonary affections, viz., pleurisy, bronchitis, emphysema, pneumonia, to which may be added hemorrhage into the bronchi, and pneumothorax. It has been customary to divide phthisis into three stages, those of *consolidation*, *softening*, and *excavation*, but these are always more or less combined, and, in addition, there are frequently evidences of curative changes. The extent over which the morbid signs are noticed, varies considerably, and usually they are present in different stages over different parts of the chest. An important character in chronic phthisis, however, is, that they tend to be localized, and the rule is that they are particularly observed *over one or both apices*, especially in front, though not to the same degree. But this is not always the case, and therefore it is essential *to examine every portion of the thorax*, if there is any suspicion that phthisis is present, and also to make frequent examinations, in order to determine the progress of the case. It is not intended to divide the description of the physical signs into stages, except that those characteristic of cavities will be pointed out separately. It must be remembered that the situation, nature, and amount of the consolidation will greatly influence the signs.

1. The thorax may be congenitally small, either *alar* or *flattened*, but in many instances it is in every way well formed. At first there may be *no local depression*, or even *some bulging*, but the tendency is for the *chest to sink in* in some part, especially in the *supra- and infra-clavicular regions;* a considerable portion of one or both sides may fall in. There is often lowering of the shoulder, when one apex is involved. 2. *Local movements* are more or less

deficient, especially that of expansion. 3. *Vocal fremitus* is usually increased, but may be normal or diminished. 4. *Percussion* reveals *deficiency of resonance*, or a *rise in pitch*, to the most absolute, *hard, wooden dulness*, with more or less resistance. Over the clavicles the sound is frequently purely osteal. The *area of pulmonary sound is often diminished towards the neck*, showing contraction of the apex of the lung. The effect of holding the breath after a deep inspiration will sometimes show deficient resonance, where previously it could not be detected. Phthisis may exist, however, and percussion-sound be perfectly normal, or even unusually clear and resonant at the outset. 5. *Respiratory sounds* may be weak to complete extinction; jerky, or of "cogged-wheel" rhythm; harsh, with prolonged expiration; bronchial or blowing. In healthy parts they are often puerile. 6. The râles which may be heard are those indicative of bronchial catarrh or pneumonia; collapse-rhonchus in the neighborhood of the consolidation; and *dry crackling*, followed by *moist*, or even *bubbling*, significant of softening. 7. *Vocal and tussive resonance* are usually in excess. 8. Localized *pleuritic friction* or *creaking* is frequently observed. 9. The *heart* may be drawn up considerably and uncovered by lung, so that the impulse is extensive and strong, and the sounds loud. The better conduction of the latter to the *right infra-clavicular region* than the left, is a very useful sign of disease at the apex of the right lung. Rarely the heart is lowered. 10. A *subclavian murmur* is not uncommon, especially on the left side, from pressure on the artery. 11. The diaphragm and liver are sometimes drawn up.

Signs of Cavities.—These vary considerably, according to the size, shape, number, and situation of the cavities, as well as the state of their walls, contents, condition of the surrounding tissue, and other circumstances. It can be easily understood that vomicæ may exist without there being any, or only doubtful evidences of their presence; and, on the other hand, a careless observer might mistake signs which simulate those associated with cavities; but I cannot agree with those who assert that there are *no certain indications* of this condition, and my strong conviction is, not only that cavities may generally be detected when they have formed, but that, by careful attention to, and study of the *physical signs* present, a tolerably accurate conclusion may be arrived at as to the exact state of things, and by repeated examination at intervals, the changes which are in progress may be noted, excavations being thus often traced in their formation, enlargement, contraction, and final closure. The following are the important signs:

1. Occasionally *distinct bulging* is observed over a cavity. 2. *Percussion-sound* may be tubular, *metallic*, "*crack-pot*," or, very rarely, amphoric. A *rise in pitch* on opening the mouth is considered a characteristic sign of a cavity. 3. *Breath-sounds* are blowing, or more or less hollow, from *tubular* to *cavernous* or *amphoric*. Inspiration has a peculiar sucking or hissing character sometimes. 4. The chief *adventitious sounds* are—*large, moist râles at the apices, where there are no bronchi of any size; hollow, metallic*, or *ringing rhonchi*, varying in size, amount, and quality, being sometimes *gurgling;* rarely *metallic tinkling*, or *amphoric echo.* 5. *Vocal resonance* may have a ringing or metallic character, and is often *greatly intensified. Pectoriloquy* and *whispering pectoriloquy* are not uncommonly observed. 6. *Tussive resonance* is often painfully strong and metallic, but cough is chiefly useful in that it may cause the breath-sounds to be better heard, by clearing away secretions; or that characteristic rhonchal sounds are produced during the act. 7. The *heart-sounds* are sometimes much intensified by transmission through cavities, and may acquire a peculiar, hollow quality, or be attended with an echo. The cardiac action occasionally produces rhonchi. 8. It is said a *murmur* may be heard in rare instances, due to an aneurism on a branch of the pulmonary artery.

VARIETIES.—Different writers have classified phthisis, and have endeavored to indicate the clinical features characteristic of each variety. In the previous pages it has been attempted to explain the several modes of origin of the disease, but it may be useful to sum up here what the varieties are. Most of them will be merely enumerated, but some will need a few observations, especially to point out what are the supposed clinical distinctions between them, though on this matter much more extended observation is required, and they often are combined, or merge into each other.

The varieties may be thus arranged:

I. *Acute.* 1. Ordinary pneumonic. 2. Catarrhal pneumonic following bronchitis. 3. Miliary or tubercular.

II. *Chronic.* 1. Pneumonic. 2. Catarrhal pneumonic, after bronchitis. This tends to come on insidiously, being preceded by one severe or long-continued, or by several repeated attacks of bronchial catarrh. The thermometer reveals more or less pyrexia. The disease is prone to be localized, slow in its progress, and, under proper treatment, shows a decided tendency towards cure, with contraction and induration of the affected part. 3. *Hemorrhagic.* Two distinct meanings have been given to this term. Some merely mean that the disease has commenced with spitting of blood, or that this is a prominent and frequent symptom in its course; others that the *hemorrhage into the bronchi has actually produced the phthisis, by causing inflammation.* 4. *Fibroid.* This form has already been fully considered. 5. *Mechanical.* Produced as the result of the constant inhalation of irritant particles, this form has several subdivisions, named according to the nature of the occupation or irritation, *e. g.*, miners, colliers, knife-grinders' phthisis, carbonaceous, cotton-phthisis, &c. The progress is slow, the disease being a combination of chronic bronchitis, catarrhal and interstitial pneumonia, though at last true tubercle may form. The expectoration contains more or less of the inhaled substances, sometimes in great abundance. Thus in carbonaceous phthisis the sputa may be perfectly black, and the lungs are often observed, on post-mortem examination; to be in the same state. 6. *Secondary Tubercular*—*i. e.*, where tubercle is added to some previous morbid condition. Niemeyer has given the following signs as aids in the determination of this event, but justly remarks that the diagnosis is a matter of much difficulty,—great increase in dyspnœa and frequency of respiration, *without any corresponding increase in physical signs;* the fever becoming of a more *continued* type; and symptoms of laryngeal complication, intestinal ulceration, or tubercle in other parts setting in. 7. *Primary Tubercular.* Here there is no preceding bronchial catarrh. The patient may be evidently tuberculous, and the constitution is greatly affected from the outset, pyrexia of *continued* type and wasting being marked symptoms. Dyspnœa is often severe, with rapid breathing, *but there are no adequate physical signs.* Afterwards there may be evidences of inflammatory consolidation and destruction of tissues, but not to the same extent as in other forms. Soon there are indications of laryngeal phthisis, ulceration of the bowels, tubercular peritonitis or meningitis, &c. The progress is generally rapid. 8. *Syphilitic.* I merely mention this, as a possible variety of phthisis, but very little is positively known about it.

I must not omit again to allude here to the varieties recognized by some high authorities, such as *scrofulous phthisis,* or that due to *scrofulous pneumonia.* Among the cases, however, which have come under my observation, none have occurred indicating any such special forms of the disease.

DIAGNOSIS.—This involves not only the recognition of the presence of phthisis, but also of the seat and extent of the disease, its stages in different parts of the lungs, and, as far as possible, its nature and origin. These questions can only be determined by a proper consideration of the symptoms present, both local and general, and by *thorough, systematic physical examination.*

PROGNOSIS.—Only a few general remarks can be made on this most important subject, but those who wish for full information will find it in the valuable work of Dr. Pollock on Consumption. The ability to form a reliable prognosis in phthisis can, however, only be acquired by much experience and observation. There is now ample evidence to prove that phthisis may, in many cases, undergo complete cure, while, in a large proportion, its progress may be greatly delayed by appropriate treatment, and life rendered fairly comfortable. It is difficult to lay down any average duration or mortality, these varying so much under different conditions. In endeavoring to arrive at a prognosis, the chief circumstances to be attended to are as follows: 1. *The stage, seat, and extent of the disease.* At the early period, a hopeful opinion is warranted as a rule, though at the same time, it should be a guarded one. When cavities have formed, the prognosis is very much worse. If the disease is *limited to one apex,* even should there be a cavity, recovery is not unusual; but the prognosis is more serious in proportion to the extent of the mischief, the number of excavations present, and especially if both lungs are involved. Basic phthisis seems to be unfavorable. 2. *The prog-*

ress of the local lesions. Signs of rapid progress, either in extension of the disease, or in the tendency to softening and destruction of tissues, are very bad; on the other hand, if the disease is chronic or at a stand-still, or if, should a cavity exist, there are indications that it is drying up and contracting, the prognosis is much more hopeful. Signs of considerable local consolidation and induration from interstitial pneumonia are often favorable, as showing cessation of active disease and the progress of healing processes. 3. *Origin and nature of the disease.* Tubercular phthisis is extremely serious; when it follows catarrh, or is due to some obvious external causes, from the influence of which the patient can be removed, there is a far better chance of a favorable issue. 4. *Constitutional condition and hereditary predisposition.* A case is more dangerous if the patient is feeble and delicate, but especially if there are evidences of the existence of a tubercular or scrofulous diathesis, or if there is a strong hereditary tendency to phthisis. 5. *Local symptoms.* Continued dyspnœa, harassing cough, profuse expectoration, severe or repeated hæmoptysis, are bad indications. 6. *General symptoms.* Phthisis is dangerous in proportion to the degree of fever, rapidity and weakness of pulse, debility and incapacity for exercise, emaciation, and night-sweats. If the general condition shows signs of improvement, the pyrexia ceasing, and flesh and weight being gained, the prospect is much more hopeful. 7. *State of the digestive organs.* Inability to take food, or to digest it, are most serious drawbacks in phthisis. Cases in which vomiting is a prominent symptom are also exceedingly unfavorable. 8. *Diet and hygienic conditions.* Deficient or non-nutritious food, and improper hygienic conditions, increase greatly the evils of phthisis. This is seen constantly exemplified among the out-patients at Brompton Hospital. Many of those who become in-patients revive greatly, as the result of the improvement in their diet and surrounding circumstances. 9. The different *complications* mentioned increase the gravity of the prognosis, many of them to a marked degree.

The question is often asked in advanced cases, How long is the patient likely to last? It is useless to attempt to give more than an approximative opinion on this point, as it is so uncertain. The appearance of " thrush " is generally a sign of the "approach of the end." Another question is, as to the effect of pregnancy. Usually it seems to delay the disease for a time, so far as I have observed, but, after parturition, it generally advances with increased rapidity. Marriage of persons decidedly phthisical should certainly be opposed.

TREATMENT.—The ultimate objects to be kept in view in the treatment of phthisis are threefold, viz.: 1st, prevention and arrest; 2d, cure; or, failing these, 3d, palliation of symptoms, and prolongation of life. Every case requires thoughtful consideration, and it must not be imagined that this is a disease capable of being controlled by any one remedy or class of remedies. An essential part of the treatment, however, is that which has for its end the maintenance and promotion of a state of general good health and constitutional vigor.

1. *General Hygienic and Dietetic Treatment.*—This is of the utmost importance, both for prevention and cure, and without it all other measures are frequently unavailing. The chief things required under this head are, a *healthy residence*, on a dry soil, in a suitable climate, elevated, but well protected from cold winds, with pleasant scenery and sufficient vegetation; *free ventilation*, especially as regards the sleeping apartments; *fresh air* and *exercise*, so far as the powers of the system will permit; the avoidance of crowded places at night, and of all causes which are likely to excite pulmonary affections; the use of *warm clothing*, with flannel next the skin; the employment of cold baths, if they can be borne, with friction afterwards; the administration of as nutritious a diet as can be assimilated, which should contain a good proportion of fatty elements; and the avoidance of all injurious habits, such as intemperance, excessive venery, &c. The question of *climate* will be separately considered. It is often requisite to inquire into the *occupation*, and to change this, should it entail long daily confinement in a close room, with deficient exercise, or exposure to the exciting causes of lung diseases. At the same time, if possible, the patient should be relieved from severe mental labor or anxiety. The amount and character of the exercise to be adopted must vary in different cases, but, as a rule, *such as aids in the expansion of the chest* is to be recommended, especially in young patients, though it must be kept within

proper limits. Walking and riding are also useful, and if these cannot be endured, passive exercise is to be enjoined, the patient being driven out daily when weather permits, so that at least a proper supply of fresh air may be obtained. At the same time overfatigue must be avoided. Certain acts which call into exercise the muscles of respiration are often useful, if duly regulated, such as taking deep inspirations, reading aloud, or moderate singing. Anything that interferes with the freedom of the respiratory movements, as the pressure of tight stays, or a bent position, ought to be forbidden. *Milk* is a most valuable article of diet, and some consider asses' or goats' milk specially efficacious. Whey has also been well spoken of. In many cases a little wine or beer is very beneficial.

2. In all cases where there is any fear of phthisis setting in, attention should be paid to the least sign of pulmonary disorder. Should the complaint be acute in its origin, and of an inflammatory nature, the measures already mentioned when treating of the various inflammations must be had recourse to. Further, any acute exacerbation should receive immediate attention, but it is very important, as a rule, to avoid lowering measures, and to preserve the strength as much as possible. Of course everything which is likely to produce irritation in connection with the lungs must be strictly guarded against.

3. Before proceeding to the active treatment of any case of phthisis, it is of the greatest consequence *to look to the state of the digestive organs*. Unless digestion is carried on properly, all other measures are unavailing; and here it must be mentioned that regularity of meals and other matters upon which healthy digestion depends, should receive due consideration. If any form of dyspepsia is present, the appropriate remedies must be administered. Should there be evidences of gastric irritation, a combination of bismuth with an alkaline carbonate and hydrocyanic acid is very beneficial. In the early period the bowels are often confined, and some mild aperient must then be given, so that they may be opened daily.

4. Various tonic and other medicines, which improve the state of the health generally, and of the blood, are very serviceable in phthisis. Of these the principal are the diluted mineral acids—

nitric, hydrochloric, sulphuric, or phosphoric; quinine; different preparations of iron, especially if there is anæmia; salicine; strychnia; and vegetable bitter infusions or tinctures, such as those of gentian, calumba, chiretta, quassia, cascarilla, &c. These may be given in various combinations.

5. Among the *many special therapeutic agents* recommended for phthisis, *cod-liver oil* holds the first position. Almost universal experience has testified to its good effects in this disease. It is needless to enter here into the question of its mode of action, but certain matters of practical importance as regards its administration must be mentioned. Only a small dose should be given at first, not too often repeated. A teaspoonful once or twice a day is sufficient to commence with, the dose being increased by degrees to a tablespoonful three times daily. It is seldom desirable to exceed this quantity. Most patients take the oil best immediately or soon after meals, and if it tends to disagree, lying down for a short time after taking it, will not unfrequently prevent any ill effects. Some can manage it best when going to bed at night. It is always well to make use of some vehicle for administering the oil, even when it can be taken alone, but the quantity of this should not be large. It may in many cases be given with the medicine, if this is of a bitter or acid nature or with steel wine. Milk, orange wine, stout, or a little cold brandy and water, are among the most useful vehicles. When the oil repeats, or causes sickness, it is often well borne when given with lime-water and milk in equal parts, some of which may also be drunk after it. Small doses of strychnine have been found very useful in preventing the nauseating effects of the oil. It is most important to look to the *quality of the oil*, especially at the outset, otherwise a patient may get an insurmountable antipathy to it. Different varieties are preferred by different practitioners. A good pale oil seems to answer best generally; many patients like De Jongh's pale-brown oil very well. Regularity and perseverance in the use of the remedy are essential in order to realize the effects it is capable of producing. During its administration the diet must be carefully attended to, and should not be of too rich a character. If from time to time it appears to disagree with the digestive organs it might be temporarily omitted, especially during the warmer

months. It has been recommended to introduce cod-liver oil by inunction or enema, but though necessary under some circumstances, these modes of administration are objectionable as a rule. Inunction is often advantageous in children. Special preparations containing cod-liver oil have been made, such as the "etherized oil," or a combination with quinine, hypophosphite of lime, &c.

Several substances have been advocated as substitutes for cod-liver oil, but they are far less efficacious. The chief of these are olive, skate, shark or dugong oils, cocoanut oil, dog's fat, glycerin, and cream. The last two certainly produce good effects in some cases.

Space will only permit of the mention of some other special remedies recommended. The principal are *pancreatic emulsion*, which has been introduced by Dr. Dobell, who also gives it with cod-liver oil; hypophosphites of lime, soda, iron, &c.; phosphate of lime; extract of malt; iodide of potassium; sulphurous acid and sulphites; arsenic; koumiss, &c. These have been very differently reported upon by different observers, and though most of them are useful in certain cases, they can scarcely be looked upon as *specific remedies.*

6. *Local Treatment.*—Applications to the chest are decidedly useful in many cases, either for the relief of symptoms, the subdual of inflammatory processes, or, possibly, they may have an immediate effect on some forms of phthisis. The most useful are small or flying blisters; applications of iodine, more or less powerful; and liniments of croton oil, turpentine, or acetic acid. With regard to *local removal of blood*, this measure is decidedly but seldom advisable. In acute exacerbations, fomentations and poultices are often required.

7. *Treatment of Symptoms and Complications.*—Various symptoms frequently call for attention during the course of a case of phthisis, but it is impossible to do more here than point out what they are, and suggest the indications for their management, most of them being considered in detail in other parts of this work. *Pyrexia* must be subdued, especially if it is inclined to be high. Quinine in full doses, with digitalis, might be given. My colleague, Dr. C. Theodore Williams, has been trying the effects of

cold baths in some cases, at the Brompton Hospital, and, I believe, has found them beneficial. *Debility and wasting* will be counteracted by the general treatment already described, as well as by subduing the fever. When there is much exhaustion, considerable quantities of alcoholic and other stimulants are required. *Night sweats* are best controlled by a pill at night, containing 2 or 3 grains of oxide of zinc, or by a full dose of quinine, or gallic acid. In some cases, I have found much benefit as regards this symptom, from the administration for a few days of a mixture containing quinine, alum, and dilute sulphuric acid. Sponging the upper part of the body carefully with vinegar and water is sometimes useful. *Pains about the chest* are often relieved by the local applications already mentioned, or by wearing some anodyne or warm plaster; in a large number of cases much pain in the side is complained of from time to time, either muscular or pleuritic, and this is almost invariably at once relieved *by strapping the side properly,* as described under pleurisy, which is the plan of treatment I always adopt under such circumstances. *Cough* is often a most troublesome symptom. *It is by no means always desirable to stop it,* but this must be influenced by the amount of expectoration, the discharge of which is to be encouraged, or its amount diminished, by remedies mentioned under bronchitis. In most cases, however, *it should be relieved,* and in order to do this, *it is always advisable first to look to the state of the throat and larynx,* as cough is very commonly due to some unhealthy condition in these parts. Local applications of tannin, chlorate of potash, or mere astringent gargles or lozenges, are often most beneficial. If the cough is irritable, various anodynes are valuable, especially opium, morphia, codeia, hydrate of chloral, bromide of ammonium, conium, belladonna, chlorodyne, some of which may be combined. These are best given in the form of lozenges, syrups, or linctuses, and it is desirable to make all cough-mixtures as small as possible. Anodyne and other *inhalations* are in many cases extremely serviceable, *but not for any curative effect as regards phthisis.* They are particularly useful if the larynx is affected. If the expectoration is fetid, disinfectant inhalations should be employed. Weak iodine inhalations are sometimes decidedly beneficial. *Dyspnœa* and *hæmoptysis* must be treated according to the ordinary principles.

Vomiting is sometimes a very distressing symptom: if the ordinary remedies fail, *small doses of strychnia* should be tried, and the effects produced are in some cases most satisfactory. *Diarrhœa*, if due to ulceration of the bowels, is frequently very difficult to check. Powders containing 10 grains of carbonate of bismuth, with 5 grains of Dover's powder, not uncommonly stop it, but enemata of starch and opium are most to be relied on. Other complications must be attended to as they arise.

8. *Change of Climate and Sea-voyages.*—This is a most important subject in connection with the treatment of phthisis, but only the main principles to be attended to can be indicated here. For detailed information the reader is referred to the writings of Williams, Walshe, Henry Bennett, and others. In selecting a suitable climate the chief points to be observed are—that there is neither extreme of temperature; that the air is pure, and not too moist; that the soil is healthy; and that there is no likelihood of sudden changes, exposure to cold winds, or continued unfavorable weather. It is always well also to choose a place where there is bright sunshine, attractive scenery, and pleasant company. One most important object in selecting a climate is—*that the patient may be enabled to be out in the open air as much as possible.* The salutary influence of *high altitudes* upon phthisis has been well established, and some recommend a residence in mountainous districts, even during the winter. It is questionable, however, whether this is desirable, but patients should rather reside in some warm and sheltered place during the colder months, and go to a high and dry region during the warm season. The exact qualities of the climate which are suitable for any individual case will depend upon its mode of origin, and the condition of the bronchial mucous membrane, as to its degree of irritability. Those cases which are of constitutional origin are particularly benefited by a sojourn in lofty regions. The principal *seaside* places suitable for phthisical invalids are the Isle of Wight, especially Ventnor, Bournemouth, Torquay, Hastings, Penzance, Worthing, Sidmouth, Southport, Grange, Clevedon, and Tenby, in this country, where the temperature is moderate, but moisture considerable; Mentone Nice, San Remo, Palermo, Cannes, Malaga, Malta, Algiers, &c., where there is a high temperature, with but little moisture; Ma-

deira, West Indies, and the Azores, where both temperature and moisture are considerable. Among *inland regions*, Pau, Pisa, Upper Egypt, Syria, Australia, certain parts of South Africa, are recommended; or, if elevated districts are desired, the Alps, Andes, Himalayas, or Mexican mountain ranges afford the requisite conditions.

Long voyages, especially to Australia, or up the Mediterranean, are most useful in many cases, but they should not be recommended if the disease is too far advanced.

A large number of patients are unable to avail themselves of the benefits to be derived from a suitable climate, though, thanks to the various hospitals established in many seaside places in this country, these advantages are more widely disseminated than they were formerly. If, during the winter months, patients are unable to get to a proper climate, they should keep indoors as much as possible in bad weather, avoid every cause of cold, and wear a respirator. Men should allow the beard and mustache to grow. The treatment of consumption by mineral waters, compressed air, inhalation of oxygen, &c., does not seem to have been of much use.

CHAPTER XV.

CANCER OF THE LUNGS.

Etiology.—This disease, which is exceedingly rare, is far most common from 40 to 60 years of age, and more males are affected than females. It has been supposed to be infectious, or inherited. It is, in the large majority of cases, *secondary*, especially to cancer of the bones or testicles, but may result from *direct extension*, or be *primary* in its origin. It generally extends, so as to involve neighboring parts, but is very rarely followed by secondary cancerous formations in other internal organs.

Anatomical Characters.—*Encephaloid* is the variety of cancer usually found in the lungs, and it is often extremely soft, pulpy, and vascular. Other forms are occasionally met with, alone or in combination, and considerable deposit of black pigment may be observed, constituting *melanotic cancer.*

Secondary cancer is almost always in the nodular form, and affects both lungs: the nodules vary much in size, and when at the surface tend to be depressed; by their union a lung may be involved throughout. *Primary cancer* is particularly prone to involve only one lung, especially the right, and is often infiltrated. After a time the cancerous matter undergoes fatty degeneration and softening, cavities being produced in some cases, and extravasations of blood into its substance are common. The vessels and bronchi are often either involved in the disease or obliterated by pressure. The unaffected part of the lung-texture may be normal, or various morbid changes are set up. A cancerous lung feels remarkably heavy. Extensive pleuritic adhesions are usually observed.

SYMPTOMS.—Secondary cancer tends to come on insidiously, without any subjective symptoms. I have seen a case in which the left lung was involved almost throughout, and the right also extensively, but the only symptoms were occasional cough, with shortness of breath on exertion. In primary cancer, there is usually *pain in the chest,* which may be extremely severe, lancinating, and accompanied with tenderness. *Cough* is present, attended in some cases with a *peculiar expectoration,* in the form of a substance resembling red or black-currant jelly, or occasionally containing cancer elements. *Hæmoptysis* is very common. *Dyspnœa* is generally present, and it is especially severe if there are projecting nodules, pressing on the nerves, or if the cancer is associated with a mediastinal tumor, when there are other signs of pressure on neighboring structures.

The *general* symptoms are not usually so severe as might be expected. The cancerous cachexia may or may not be evident; emaciation, fever, night-sweats, with failure of strength, are generally present more or less, but they may be comparatively very slight, especially in the secondary form. Wasting is sometimes extremely rapid in its progress when once established.

PHYSICAL SIGNS.—These will vary according to the form, seat, and amount of the cancerous accumulation, and whether it is accompanied with a mediastinal tumor or not. Where there are scattered nodules, the percussion and respiratory sounds may be somewhat altered. If a lung is extensively involved with nodular cancer, being ultimately converted into a mass of encephaloid, the signs are: enlargement of the side, with widened and flattened spaces, the surface being unusually smooth, but *without any sense of fluctuation;* great deficiency, or entire absence of movement; weakened or annulled vocal fremitus; complete dulness, *unaltered by position, with great sense of resistance;* breath-sounds often weak or absent over a variable area; vocal resonance deficient; displacement of heart or diaphragm, the cardiac sounds being frequently conducted to an unusual degree. Such were the signs in the case already alluded to. In the *infiltrated form,* the lung is *contracted,* and physical examination reveals: retraction of the side, with depression of the spaces; deficient movement, but the spaces still act; vocal fremitus, either increased, lessened, or absent, according to the amount of consolidation; hard, wooden, high-pitched, or tubular percussion, *which may extend across the middle line;* bronchial, blowing, or feeble respiratory sounds; vocal resonance often intensified; displacement of the heart, either towards the affected or opposite side, with intensification of the sounds, and drawing up of the diaphragm. Ultimately there may be signs of cavities. In the non-cancerous parts, signs of hypertrophy, bronchitis, emphysema, &c., are usually present.

PROGNOSIS is necessarily fatal, death occurring either from local or general causes.

TREATMENT can only be palliative, and the usual remedies must be employed for symptoms as they arise.

RARE FORMATIONS IN THE LUNGS.

It will be only necessary to enumerate these, so as to indicate their possible occurrence. Those that need recognition include *hydatids; albuminoid degeneration; sarcomatous, enchondromatous, osteoid,* or *myeloid tumors; hæmatoma.*

CHAPTER XVI.

PLEURISY.—INFLAMMATION OF THE PLEURA.

ETIOLOGY.—*Exciting Causes.* These include: 1. Direct irritation of the pleura, from injury; *foreign matters which have gained access into its cavity, e. g.*, pus, air, &c.; local deposits in the pleura, *e. g.*, cancer, tubercle; diseased bone; friction or pressure of tumors. 2. Cold, or other injurious meteorological influences, though many deny any such mode of causation. 3. Possibly "extreme muscular overexertion and exertion in continuous public speaking" (Anstie). 4. Extension from neighboring parts, *e. g.*, the pericardium, and under this cause may be also mentioned the pleurisy which accompanies pneumonia in most cases, or complicates other pulmonary affections, especially phthisis. 5. Blood-poisoning, in various acute febrile diseases, especially scarlatina, typhoid, puerperal fever, acute rheumatism; pyæmia and septicæmia; Bright's disease; or alcoholism.

According to its mode of origin, pleurisy has been divided into *primary* or *idiopathic*, and *secondary*. The former is due to some cause acting immediately on the pleura, the patient having previously been in good health; the latter is the result either of some constitutional affection, or of previous visceral organic disease. In the latter case, however, it is not improbable that it may in some instances be brought about by a slight exciting cause, acting on a depraved constitution, which greatly predisposes to serous inflammations. Of other *predisposing causes* but little is known. Pleurisy may occur at any age. Probably it is more common in the colder seasons.

ANATOMICAL CHARACTERS.—Like other inflammations of serous membranes, pleurisy, if it is at all extensive, and runs a regular course, is characterized by the stages of *vascularization, lymph-exudation, fluid effusion, absorption*, and *adhesion*. The costal pleura seems to be first affected as a rule. At the outset the appearances are bright redness, from capillary injection, often with spots of extravasation; dryness and loss of polish of the membrane, with thickening, cloudiness, and diminution in consistence. Then exudation covers the surface more or less extensively, varying in quantity and characters, and being usually stratified. A sero-fibrinous fluid begins to accumulate in the pleural sac, in some cases from a very early period, in which float fibrinous flocculi, the amount varying exceedingly, but it may be so abundant as to fill the sac completely. More or less blood may be present, as well as gas, the latter probably being due to decomposition. The epithelial cells of the membrane undergo proliferation, and the young cells thus produced are seen in the exudation and fluid. If the case is favorable, the effusion is absorbed, much of the exudation is also taken up, after undergoing degenerative changes, while the remainder becomes organized into adhesions or agglutinations, these also resulting sometimes from papillary, vascular growths from the subepithelial tissue.

In some cases, owing to an unhealthy condition of the system, or excessive formation of cells, the fluid is not taken up, but remains, and becomes purulent to a greater or less degree. The exudation may also become caseous, and lead to the formation of tubercle; or calcification sometimes occurs.

The lung, if not previously consolidated, is first floated forwards and relaxed, and then compressed, until ultimately it is completely "carnified." If the pressure is removed soon, it will expand again; otherwise it is in danger of being rendered permanently useless, or of undergoing further destructive changes.

In a good proportion of cases, pleurisy merely occurs over a very small patch, where slight exudation occurs, and an adhesion soon forms. In a few instances, I have observed distinct evidence of *extensive formation of lymph*, with little or no fluid effusion. Sometimes the serum is "loculated" by adhesions. Rarely pleurisy is *bilateral*, being then generally associated with some constitutional diathesis.

By *chronic pleurisy* is usually meant either adhesion of the pleural surfaces, with falling in of the side, the result of an acute attack; or a condition in which the effusion remains, and cannot be absorbed, being either serous or purulent, and in either case named *empyæma;* or where an opening has been formed externally, through which there is a permanent discharge (*fistulous empyœma*), into the bronchi, or very rarely into the bowels. Occasionally the disease seems to be chronic in its origin, especially when secondary, and under this class of cases might be included those in which there is a tendency to repeated, limited attacks.

If there is abundant effusion, the neighboring organs will be found displaced, especially *the heart in left pleurisy*. This is partly due to pressure, partly due to elastic traction on the part of the lung which is free to act. Dr. Douglas Powell affirms that the axis of the heart can never diverge beyond the vertical line, or only to a very slight degree, so that the apex does not point to the right; which is contradictory of the statements made by other observers. The right side of the heart and venous system are often overloaded.

SYMPTOMS.—In all serous inflammations the symptoms observed are of three classes, viz.: 1st. Those due directly to the affection of the membrane itself, and tissues immediately adjoining; 2d. Those resulting from the mechanical pressure of inflammatory products on neighboring organs and structures; and 3d. Those indicating constitutional disturbance. Much variety is presented in the intensity of the symptoms of pleurisy, and that by no means always in proportion to the importance of the case. In many instances, which are common enough in hospital out-patient practice, where the disease is localized in a small patch, the *one evident symptom* is a "stitch in the side," which may be very severe, increased by breathing, coughing, and often by pressure, the patient leaning towards the affected side, which is kept as much at rest as possible, respiration being very shallow. There are no general symptoms.

A typical case of acute primary pleurisy with effusion has the following clinical history. At the outset, several chills are felt, not severe, accompanied, or soon followed, by certain local symptoms, pyrexia also setting in speedily.

Local Symptoms.—Acute pain is felt, usually in the inframammary or infra-axillary region, of a dragging, catching, or stitch-like character, increased by breathing or coughing, and attended with superficial or deep tenderness. The sharpness of the pain is often evidenced in the expression, posture, and mode of breathing of the patient. *Respiration* is carried on in a hurried, shallow, and irregular manner, but there is no actual dyspnœa at first, and the number of respirations is rarely above 30 to 35. Later on, there is *evident dyspnœa*, should much fluid be poured out, owing to mechanical pressure, which varies in degree, being in some cases very severe. *Cough* is generally present, though the patient tries to repress it; it is short and hacking, generally dry, or at least unattended with any particular expectoration. Sometimes it is excited by making the patient sit up, or bend forward. At first the position assumed is *lying on the affected side*, but later on there is no uniformity, for it is not uncommon to see patients with one pleura full of fluid, habitually rest on the healthy side.

General Symptoms.—*Pyrexia* is present, but it is not very marked, and the temperature has no typical course. The pulse is frequent, varying usually from 90 to 120, full and bounding, but deficient in resistance, as evidenced by the sphygmograph (Anstie). The pulse respiration ratio is altered somewhat, but not to any great degree. There is very little prostration. Disturbance of the digestive organs, headache, and other febrile symptoms are present more or less. The urine may be slightly albuminous.

In a few days, in favorable cases, the symptoms subside and the fluid is absorbed. Should this not happen, frequently only a little dyspnœa remains. Ultimately, the effusion may in time be taken up, or discharged through the bronchi or externally, or be removed by operation. In cases of chronic effusion, pyrexia often continues, the skin being hot, dry, and harsh, and the pulse frequent but weak. The patient wastes, and becomes much debilitated. Œdema of the affected side, and extreme clubbing of the finger ends, are sometimes noticed. Fistulous empyæma is attended generally with great weakness, loss of flesh, and a tendency to hectic fever. The hair frequently falls off. Ultimately symptoms of tuberculosis may arise. The formation of pus has been supposed to be indicated by repeated rigors, but certainly this is not always the case. Perforation into the bronchi is attended with profuse expectoration of matter. Should extensive adhesions form, with retraction of the side, more or less shortness of breath remains, with a liability to occasional pains in the sides, and a want of power in the system.

It is very important to notice that *extensive effusion* may take place, without there being any symptoms to draw attention to the chest (*latent pleurisy*), and this is especially liable to happen in secondary pleurisy, or when it occurs in children. *Bilateral pleurisy* is necessarily a serious affair, and is attended with much dyspnœa. *Diaphragmatic pleurisy* probably causes very severe pain, and also interferes greatly with breathing.

PHYSICAL SIGNS.—In the *early stages* the only reliable physical signs are: 1. Diminished movements on the affected side, on account of pain. 2. *Friction-fremitus*, which is exceedingly rare. 3. *Friction-sound*, at first slight and grazing, but becoming much louder when lymph is deposited. It may be limited to a small spot, or heard extensively over the side.

Should *fluid effusion* take place, the signs are usually quite characteristic, being, however, considerably modified by its amount and mode of accumulation. Usually the evidences of effusion are first observed over the lower part of the chest, and extend upwards more or less rapidly. 1. *The side is enlarged*, and *the spaces are often specially affected*, being either *flattened* or *bulged out*. It is important to make use of the *cyrtometer* in determining this, as the measurement may be actually less than on the healthy side. 2. *Movement is diminished* or almost completely *annulled*. 3. *Vocal fremitus* is *deficient* or *absent below, in excess above*, there being frequently an abrupt transition from the one to the other, particularly in front. 4. *Fluctuation* may occasionally be detected. 5. *Percussion-sound is dull over a variable area*. Beginning below, the dulness may ultimately extend over the whole side, and beyond the middle line for some distance. If the patient has assumed the recumbent posture early, dulness is sometimes present over the whole side posteriorly, before any is observed in front. It is said to be movable with a change of posture of the patient, but frequently this is not the case. In many instances, at a certain period, there is *an abnormally clear or tubular sound under the clavicle*, and the transition from dulness may be quite abrupt. Occasionally it simulates crack-pot sound. 6. *Breath-sounds* are *absent* or *feeble* below, *exaggerated*, or even *blowing* or *tubular* above. 7. *Friction-sound* may or may not continue. 8. *Vocal resonance* is *diminished or annulled below, increased above,* the change being often marked. *Ægophony* is frequently heard, especially about the angle of the scapula. 9. *Displacement of organs* is an important sign, especially of the *heart.* Its impulse may be noticed far over on the right side in cases of left pleurisy, and its sounds are very loud here. The impulse, however, is probably connected with the *right ventricle.* The diaphragm, with the liver, spleen, or stomach, are also often depressed. Some cases have come under my notice in which a cardiac murmur seemed to be due to displacement. 10. Rarely *succussion* gives rise to a *splashing sensation* or *sound.*

Absorption may be traced by the gradual subsidence of the signs described, and their restoration to the normal, often accompanied with a *loud redux friction-sound,* and sometimes *fremitus.* Dulness may hold on for some time. The side will resume its proper form and size, and the lung expand in favorable cases. The heart occasionally remains in its abnormal position, owing to adhesions, or goes too far in the opposite direction, or lies loose. Should the lung remain unexpanded, the signs are: 1. *Retraction and general diminution of the side,* the ribs being crowded together, the shoulder lowered, all the diameters of the chest diminished, especially the antero-posterior, and the spine curved, usually to the diseased, occasionally to the healthy side. 2. *Movements null or greatly lessened.* 3. *Deficient resonance.* 4. *Feeble respiratory sounds* over the side generally, or in some parts of *bronchial quality. Fistulous empyæma* is followed by *great retraction of the side.*

The signs of fluid may now and then be observed *on both sides.* On the other hand they are *limited* in the "loculated" variety of pleurisy, which may cause *local bulging.* The fluid sometimes makes its way to the surface, and even points, or, in rare instances, presents pulsation, when in the neighborhood of the heart. Should an empyæma open into the bronchi, râles will be heard, and sometimes pneumothorax is produced. In *diaphragmatic pleurisy* there may be no signs, except *cessation of all abdominal movement in respiration.*

With regard to children, some important modifications in physical signs are noticed. The chest being very yielding, is dilated considerably, and at a very early period, while the orga are comparatively less displaced. Bronchial breathing and voc resonance often persist also, when the thorax is full of fluid.

Old adhesions, due to previous attacks, may influence the sig of pleurisy considerably, as well as lung-consolidations.

TERMINATIONS.—Most of these have been already indicated the description of the clinical history of pleurisy, but it will well to bring them together here. 1. *Recovery* takes place i large proportion of cases, after absorption or removal by operation of any fluid, the lung expanding fairly, but adhesions remaining behind. 2. *Death* is a rare event in acute cases, unless the pleurisy is bilateral, or associated with some serious constitutional or local disease. It may occur, however, from the mere mechanical effects of fluid effusion, accompanied with pulmonary congestion and œdema, and there is a danger of its being sudden, should there be great dyspnœa. Later on death may happen as the result of some of the events to be next noticed. 3. *Transition into the chronic state.* Under this would be included—*a.* Chronic effusion. *b.* Retraction of the side from extensive adhesions, and binding down of the lung. *c.* Chronic purulent discharge, either by an external opening, through the air-passages, or in some unusual direction, such as into the intestines. In these cases, the patient may ultimately either sink gradually, or become phthisical, or sometimes recovery follows, though with permanent loss of the use of the lung on the affected side.

DIAGNOSIS.—It is only necessary to mention here, that pleurisy has not merely to be distinguished from other affections of th lung or pleura, but that it may be simulated at first by painf affections of the chest-wall, or, later on, by *enlargement of the li or spleen, hydatids,* or *a large tumor within the chest.* Careful ph ical examination is mainly to be relied upon.

PROGNOSIS.—This involves not only the immediate result of ease, but also its ultimate issue. *Primary pleurisy* ought to te nate favorably in the great majority of cases, if properly man It is more serious in proportion to the amount of fluid poure the time it has remained in the pleura, and its tendency to b purulent. *Severe dyspnœa* is a dangerous sign. The therm and sphygmograph (Anstie) are useful in aiding towards nosis. *Pleurisy secondary to constitutional diseases* is very grave, or when it occurs in advanced cases of chronic alcoholism. *Bilateral pleurisy with effusion* is necessarily most serious. The different forms of chronic pleurisy are often unfavorable. Discharge of pleuritic fluid through the lungs has been considered a most untoward termination, but I have known some cases do remarkably well after this. It must be remembered, that when pus forms, or caseous degeneration is going on, there is a danger of tuberculosis being set up.

TREATMENT.—The activity of the measures to be adopted in the management of pleurisy must differ greatly in different cases, and I strongly protest against any routine practice of removing blood, blistering, and administering mercury in this disease, which, whatever may be said to the contrary, is, even at the present day, by no means an uncommon mode of practice. The ultimate objects to be kept in view are not merely to save the patient's life, but to leave the parts affected in as normal a condition as possible.

The principles which should guide us in the treatment of pleurisy are these: 1. To subdue the inflammation, and diminish the amount of lymph and fluid poured out. 2. To promote the absorption of these materials as rapidly as possible. 3. If they cannot be absorbed, to remove them in some other way. 4. To relieve symptoms, if required. 5. To support the strength of the patient, should it fail.

1. The *first thing* which is attended to in the treatment of inflammation of *synovial*, as well as of *other* serous membranes, is to keep the parts affected in *as complete a state of rest as can be obtained*. This should be also the *primary measure* adopted in the management of pleurisy. For some years I have been in the habit of paying special attention to this matter, by *mechanically fixing the side affected, and preventing its movements*, and am firmly convinced of the beneficial effects resulting therefrom. Formerly, it was my custom to apply bandages soaked in a mixture of gum and chalk, or in starch, over the side, but at present obtain the desired rest by means of strapping. The method adopted is as follows: Strips of some properly adherent plaster, spread on a firm material, are cut, about 4 inches wide, and sufficiently long to extend round the side, from mid-spine to mid-

sternum, or a little beyond. These are laid on over a variable extent of the chest, according to the severity of the case, it being sometimes requisite to include the whole side *beginning below.* The patient is directed to *expire* deeply, and at this time, a strip of the plaster is fixed at mid-spine, and drawn tightly round the side, *in the direction of the ribs;* then another strip is laid on over this, in the same way, but *across the course of the ribs;* the third follows the direction of the first, *overlapping about half its width,* the fourth that of the second, and so on in alternate directions, until the entire side is included, if required. A strip may be passed over the shoulder also, this being kept down by another, fixed round the side across its ends. The good effects realized by this method of treatment have been these: 1st. In those cases of *limited dry pleurisy,* which are very common, especially in phthisis, as well as exceedingly distressing, *it gives almost invariably complete relief,* so that patients can breathe and cough comfortably, and *follow their occupations without discomfort,* which is particularly necessary in the case of those who are obliged to work. 2dly. It is reasonable to suppose that the quantity of inflammatory products poured out will be limited by this condition of rest, and their absorption promoted. I have every reason to conclude that these results were realized in several cases. The pressure may also aid absorption, a matter which will be alluded to presently. 3dly. Occasionally cases come under observation, in which there is *extensive exudation of lymph,* with little or no fluid, and this remains as a chronic condition, causing palpable fremitus, attended with most unpleasant sensations. The only curative end that can be attained, is to bring about adhesion of the surfaces, and strapping the chest will most certainly do this.

Venesection, or even *local bleeding,* is, in my opinion, scarcely ever required. *Calomel* is a drug which had better be avoided, except as an aperient. Many cases require nothing but *rest,* but if the attack is at all severe, the best therapeutic agents at the outset are those which act on the heart, such as *aconite, veratrium,* or *tartar emetic,* which may be given in some saline mixture. *Opium* is most valuable also, aiding in relieving pain and procuring sleep, if necessary. Dover's powder is a very useful form for administering it. Cold to the chest has been recommended.

2. Should there be much effusion—and this is not unfrequently the state of things when the patient comes under notice—*free counter-irritation over the chest* is decidedly beneficial, by means of repeated large blisters, or the application of iodine liniment. I have certainly seen some instances in which *strapping the side* has appeared to aid absorption by pressure. Medicines which act on the skin, bowels, or kidneys, are those which are supposed to be most efficient in promoting absorption. I believe full doses of iodide of potassium, with infusion of digitalis and other diuretics, do good sometimes. Powerful purgatives are of questionable value, and should be employed with caution, if at all, but the bowels should be kept freely opened. Repeated vapor or hot-air baths have proved serviceable in some instances under my care. Dr. Anstie strongly recommends *tincture of iron.*

3. A most important matter as regards the treatment of pleuritic effusion, and one which is attracting much attention at the present time, is the *removal of the fluid by paracentesis thoracis.* Formerly it was regarded as merely a last resource; now *it ought to be looked upon as a legitimate and most important part of the treatment.* Many questions connected with this subject are still matters of dispute, such as the time at and circumstances under which it ought to be performed; the instrument to be employed; the amount of fluid to be removed; and whether it is dangerous or not to allow the entrance of air into the pleura. There is ample evidence to prove the great value of paracentesis, even in acute cases, especially in children, and from personal practice, I can add my testimony in favor of this measure. In Dr. Anstie's excellent article on Pleurisy in " Reynolds's System of Medicine," the circumstances under which paracentesis ought to be performed are well stated as follows: 1. In all cases of pleurisy at whatever date, where the fluid is so copious as to fill one pleura, and begins to compress the lung of the other side. 2. In all cases of double pleurisy, when the total fluid may be said to occupy a space equal to half the united dimensions of the two pleural cavities. 3. In all cases where, the effusion being large, there have been one or more fits of orthopnœa. 4. In all cases where the fluid can be suspected to be pus, an exploratory puncture must be made; if purulent, the fluid must be let out. 5. In all cases where a pleu-

ritic effusion occupying as much as half of one pleural cavity has existed so long as one month, and shows no sign of progressive absorption.

The various modes of operating must be ascertained from surgical works. It is not necessary to remove the whole of the fluid, provided it is not purulent. It is probably safer to exclude air, if possible. If a fistulous opening remains, and a fetid pus escapes, the cavity of the pleura should be washed out with lukewarm water, which may contain some disinfectant, such as a little carbolic acid, or tincture of iodine (1 part to 4).

4. The symptom likely to call for special attention is *pain*. If not relieved by rest, the best plan is to employ *subcutaneous injection of morphia*. If the side is not strapped, hot fomentation or poultices, or sinapisms may be tried. *Urgent dyspnœa* calls for paracentesis usually. *Cough* must be relieved if troublesome.

5. Patients need not be kept low in pleurisy, as regards diet, but stimulants are not to be given at first. If the strength fails, and especially in those chronic conditions, abundant nutritious food is required, with wine or beer. Quinine, mineral acids, cod-liver oil, and other remedies of this kind are also very useful at this time.

The treatment of *secondary pleurisies* must be guided by the condition with which they are associated. Lowering measures are especially to be avoided in these cases, as a rule.

CHAPTER XVII.

HYDROTHORAX.—DROPSY OF THE PLEURA.

ETIOLOGY.—Almost always this is found in practice to be a part of *general dropsy*, from cardiac or renal disease. It is said to be very rarely of an *active* kind associated with cancer or tubercle.

ANATOMICAL CHARACTERS.—More or less clear serous fluid collects in *both pleural sacs*, compressing the lungs. There are none of the signs of inflammation.

SYMPTOMS.—*Dyspnœa with sign of deficient blood-aeration* are the only symptoms, resulting from mechanical interference with the action of the lungs, and there is generally much distress, because hydrothorax is added to some previous serious affection, and because both sides are involved. The *physical signs* are those *of fluid in both pleuræ; not excessive in amount; freely movable; without friction-sound or fremitus; there being no displacement of the heart.*

TREATMENT.—As a rule this is merely a part of the general treatment for dropsy. Dry cupping over the chest might be employed. In extreme cases, paracentesis is indicated, in order to afford temporary relief.

HÆMOTHORAX.—HEMORRHAGE INTO THE PLEURA.

ETIOLOGY.—Blood may be mixed with pleuritic effusion from inflammation, to a variable degree, or with the ordinary serum, if there is a scorbutic or purpuric tendency. The accumulation of blood in any quantity in the pleura is due to one of the following causes: 1. Rupture of a vessel from injury, or its perforation during operation. 2. Bursting of an aneurism, of which I have seen a most interesting example, in which an aneurism of the aorta between the pillars of the diaphragm ruptured into the left pleural cavity. 3. Carcinoma of the lung, giving way into the pleura. 4. Diffuse pulmonary hemorrhage, extending to the surface. 5. Cancer of the pleura itself.

SYMPTOMS.—There is *dyspnœa* from the pressure of the blood, with *evidences of loss of blood.* Death may occur very speedily. The *physical signs* are merely those of *pleuritic accumulation,* either liquid or solid.

TREATMENT.—In most non-traumatic cases, nothing can be done but to keep the patient at rest. Of course if there is any injury, it is necessary to try to stop the bleeding. Paracentesis may possibly be required.

PNEUMOTHORAX.—HYDRO-PNEUMOTHORAX.

ETIOLOGY.—1. Practically, pneumothorax of any clinical importance comes under the notice of the physician, in the great majority of cases, as the result of *perforation from the lung, from rupture of a phthisical cavity;* it may occur in the earlier stages of phthisis; and among *very rare* causes of giving way of the lung, with escape of air, are mentioned emphysema, abscess, gangrene, rupture of vesicles from violent cough, especially hooping-cough, or of a subpleural emphysematous collection, hemorrhage, hydatids, cancer. 2. Perforation may take place *from the pleura,* in connection with empyema, or abscess of the chest-walls. 3. Injury, either from direct perforation from without, fractured ribs, or severe contusion, may lead to pneumothorax. 4. The stomach or œsophagus has been known to give way into the pleura. It is unnecessary to consider those cases in which gas is present from decomposition of fluid.

Anatomical Characters.—The gas generally consists of oxygen, carbonic anhydride, and nitrogen in variable proportions, with, under some circumstances, fetid ingredients, such as sulphuretted hydrogen. It may fill the pleural sac completely, compressing the lung, or is sometimes limited by adhesions. It excites inflammation, the products of which are seen, the fluid being either serous or purulent.

Symptoms.—It is only necessary to consider those which are indicative of perforative pneumothorax. Usually a *sudden, very intense pain* in the side is experienced, also occasionally a sensation of something giving way, and of fluid pouring out, with *urgent dyspnœa* and *evidences of shock.* These symptoms frequently *immediately follow a violent cough.* The dyspnœa may temporarily diminish, or go on increasing in proportion to the amount of air accumulated, until there is constant or paroxysmal orthopnœa. The voice becomes feeble, in some cases to complete aphonia. *Cough is often rendered difficult and ineffective,* and *expectoration ceases.* Occasionally there is much hyperæsthesia of the side. The pulse is frequent, weak, and small, but breathing being hurried out of proportion, the pulse-respiration ratio is altered. The patient generally presents an anxious and distressed aspect, and soon there are evidences of apnœa. A common mode of decumbency at first is dorsal, with the head raised, and an inclination to the sound side; or the patient may kneel, supported on the elbows. In many cases the posture is changed frequently, and when fluid collects, there is a tendency to lie on the affected side.

It must be borne in mind that even in severe cases the symptoms may be by no means marked, and where the escape of air is limited by adhesions, they are usually comparatively slight.

Physical Signs.—The amount of air present, the existence and quantity of fluid mixed with it, and the continuance or closure as well as the size of the perforation into the lung, will modify the physical signs present. 1. *The side is enlarged, often to an extreme degree, the spaces being widened and effaced, or even bulged out, so that the surface of the chest feels smooth.* 2. *Movements are deficient or annulled.* 3. *Vocal fremitus is weak or absent.* 4. *Percussion* reveals at first *increased resonance, even to true tympanitic sound,* which may extend considerably across the middle line. Sometimes it has an *amphoric* quality. *If the amount of air is extreme,* there is *dulness with much resistance.* When effusion takes place, *dulness* will be observed *in dependent parts, movable with change of posture* usually. Occasionally at the line of junction of fluid and air an amphoric note is produced, with a quivering sensation to the fingers. 5. *Respiration-sounds* may be *weak and distant, or almost suppressed; typically amphoric* when the fistula is open, with a *metallic echo;* or alternately one or the other. *A whistling inspiration* is produced in rare instances, by the passage of air through a narrow chink. 6. *Vocal resonance* may be *feeble* or *absent;* or *exaggerated,* with a *metallic echo,* and the whisper in some cases is very loud, and has a marked metallic character. 7. *Cough* also may have a *metallic echo.* 8. *Metallic tinkling* is sometimes distinctly produced by breathing, coughing, or speaking; and the *bell-sound* may be elicited. 9. *Succussion* produces a *splashing sensation* and *sound,* if both air and fluid are present. 10. The *mediastinum, heart, diaphragm,* and *abdominal organs* are displaced to a variable degree. 11. The heart-sounds are now and then intensified on the affected side, and attended with a *metallic echo.*

Prognosis.—Though a very grave event, pneumothorax is not necessarily fatal, recovery occasionally taking place. It is less dangerous if localized. In some instances where it has occurred during phthisis, it seems to have delayed the progress of the disease.

TREATMENT.—I have found great relief in some cases, from strapping the side firmly, as described under pleurisy. If the amount of air is considerable, causing much dyspnœa, paracentesis must be performed, and pressure may be afterwards applied. Dry cupping of the chest is sometimes useful. Stimulants and antispasmodics should be given to counteract shock and dyspnœa. Dr. Walshe recommends repeated inhalations of small quantities of chloroform. Pleurisy must be treated, should it arise.

CHAPTER XVIII.

GENERAL DIAGNOSIS OF AFFECTIONS OF THE LUNGS AND PLEURÆ.

IT has appeared to me that it might be useful to bring together the chief pulmonary diseases which resemble each other, and point out their diagnostic marks. Their separation can in many cases only be effected by a full consideration of the history, local symptoms, general condition, and physical signs present. The last merely disclose the existing physical conditions, and cannot alone determine the nature of the disease as a rule, though they afford most valuable aid towards this end.

1. DIAGNOSIS OF ACUTE AFFECTIONS.—The diseases belonging to this class which require special notice are *bronchitis*, *pneumonia*, croupous or catarrhal, *pleurisy*, and *acute phthisis*. It may be serviceable to arrange their chief characteristic features in the form of a table (pp. 526, 527).

It is impossible in an arrangement like the preceding, to do more than indicate in a general way the main differences between these ordinary diseases. It must be remembered that non-typical cases occur, and that these affections are often presented in various combinations. Usually the chief matters as regards diagnosis are to distinguish—1. Bronchitis from pneumonia, especially catarrhal, when it complicates bronchitis. 2. Basic pneumonia from pleurisy. 3. Acute phthisis from either form of pneumonia or extensive bronchitis, as well as the different varieties of this disease from each other.

The diagnosis of congestion and its results, abscess, gangrene, &c., have been sufficiently indicated in the descriptions of these morbid conditions. It should be mentioned that it is often difficult to diagnose between mere *lobular collapse* and *lobular pneumonia*, but the thermometer will aid greatly in distinguishing them.

2. Occasionally a case comes under observation where *one side is enlarged*, and there is a doubt as to whether the physical signs are due to *fluid*, or to *very extensive solid accumulation*, especially *secondary cancer of the lung*. Under such circumstances the diagnosis must be founded on—*a*. The history of the case. *b*. Certain physical signs, viz., in consolidation, the chest is uneven on its surface, there is *no fluctuation*, but a *marked sense of resistance on percussion*. As a rule also there is bronchial breathing, increased vocal resonance, and conduction of the heart-sounds, though there may be *complete absence of breath-sounds and voice*, except perhaps *in some spots*, such as close to the spine. *c*. The symptoms present, and general condition. In consolidation there are frequently *pressure symptoms, more severe cough and expectoration, and the sputa may have special characters, hæmoptysis* being also not uncommon. If there is any actual uncertainty recourse must be had to the employment of *a small, exploratory suction-trocar*, by means of which some fluid, if present, may be removed for examination, and no damage is done if there is none. If necessary, this method of *diagnosis* may be turned into one of *treatment*, by taking away the effusion through the canula introduced.

3. There are certain conditions in which signs of *increase of air within the chest* are observed, viz., *emphysema, hypertrophy of the lung*, and *pneumothorax*. There may be some difficulty in separating the two former, and they are often more or less associated. *Hypertrophy* is generally *unilateral, following some affection which evidently interferes with the action of the opposite lung, while*

	Bronchitis.	Croupous Pneumonia.	Catarrhal Pneumonia.	Pleurisy.	Acute Phthisis.
1. Mode of invasion.	Coryza, and other symptoms of "cold" Not marked rigors, but only slight and repeated chills, if any.	A single, severe, prolonged rigor.	Generally after bronchitis or collapse, and without distinct rigors.	Several not severe rigors.	Follows pneumonia, bronchitis, or catarrhal pneumonia; or begins with severe rigors, often repeated.
2. Sensations about the chest.	Soreness, heat, &c., behind the sternum. Muscular pains from cough.	Pain in the side frequently, not stitch-like, but more dull and diffused.	Pains about the chest often, but not specially localized.	Severe, stitch-like pain in side.	Generally pains in various parts of the chest.
3. Cough.	In paroxysms, often severe.	Considerable, and in paroxysms.	Short, hacking, and painful.	Slight, and patient tries to repress it.	Frequent and violent fits.
4. Expectoration.	Abundant mucous, muco-purulent, &c., changing its characters as the case progresses.	Considerable; viscid, tenacious and "rusty."	Often less than before; not "rusty."	Absent, or very slight, and of no special characters.	Abundant, either bronchitic, or sometimes "rusty," or there may be hæmoptysis.
5. Disturbance of breathing.	Sense of dyspnœa, in proportion to the extent of the disease; may be extreme. Pulse-respiration ratio not proportionately altered.	Very rapid breathing, and much perversion of pulse-respiration ratio, but not proportionate feeling of dyspnœa.	Rapidity of breathing increased when it occurs in bronchitis; but feeling of dyspnœa, may be less.	Quick, shallow breathing at first, but less disturbance of pulse-respiration ratio than in pneumonia. Later on, more or less actual dyspnœa.	Great dyspnœa, and very hurried breathing, especially in the tubercular form.

		acridly hot and dry.	**tervals.**		
7. Aspect of the patient, and general condition.	Tendency to cyanosis, if the disease is extensive. In some cases adynamic symptoms.	Marked flushing of face, often unilateral. Not cyanotic. Usually great prostration.	Face is flushed. Often much anxiety and restlessness, with loss of flesh and strength.	Nothing special. No particular prostration, or tendency to cyanosis.	Severe prostration and weakness, with profuse perspiration and rapid wasting. In the tubercular form, extreme adynamia.
8. Physical signs.	Various dry and moist râles, and rhonchal fremitus. Signs of obstruction of bronchial tubes. More or less bilateral.	At first crepitant rhonchus, followed by signs of consolidation, viz., diminished movement, increased vocal fremitus, dulness, bronchial or tubular breathing increased and metallic vocal resonance, &c. Usually one base is affected. The side is not notably enlarged, nor is there displacement of organs.	There may be signs of consolidation in scattered spots, with râles. Both lungs are usually involved in irregularly scattered patches. When it follows extensive collapse, there may be a peculiar pyramidal form of dulness.	At first friction-sound or fremitus succeeded by signs of fluid, viz., side often enlarged, movements interfered with, diminished vocal fremitus, dulness occasionally movable, weak or suppressed breathing and vocal resonance, ægophony sometimes, displacement of organs, &c. Usually on one side.	At first merely signs of bronchitis, followed by consolidation, softening, or excavations in different parts, especially the bases. In the tubercular form there is frequently nothing but scattered râles.
9. Course and termination.	Variable. No crisis. Tendency to death by apnœa or adynamia in capillary variety.	Often a marked crisis, and ends within a certain period.	No crisis, and course often prolonged.	No crisis, and course very variable.	Generally very rapid course, and fatal termination.

the breath-sounds are simply exaggerated, and there are no symptoms. Emphysema is usually *bilateral: expiration and its sound are much prolonged; there are dry râles* and *characteristic dyspnœa.* The *mode and conditions of onset; severity and nature of symptoms; almost invariably unilateral character; great enlargement of side, with typical tympanitic percussion-sound* and other *physical signs,* render the diagnosis of *pneumothorax* from the other affections mentioned perfectly easy, as a rule.

4. Perhaps as difficult a matter in diagnosis as any, is to distinguish between certain morbid conditions which produce *retraction of one side,* viz., *chronic interstitial pneumonia, retraction after pleurisy, certain cases of ordinary phthisis, collapse of the lung,* and *infiltrated cancer.* It will be only practicable here to indicate the main points to be attended to, which are: *a.* The previous history of the case in all its features, and not least its duration. *b.* Local symptoms, especially the *presence and character of pain,* and *the nature of the sputa,* which should be carefully examined, the occurrence of *hæmoptysis,* and the *character of any blood expectorated,* being points of much importance. *c. Constitutional condition* as to tuberculosis, cancer, &c. (the family history also affording much aid here), as well as the general state, as to emaciation, debility, pyrexia, &c. *d. Evidences of tubercle or cancer in other parts. e.* The *morbid physical signs present,* noting not only their *characters,* but also their seat, as to the part of the lung affected: whether one or both; and their extent. *Chronic pneumonia, cancer,* and *phthisis* are often attended with signs of cavities, these being in the last affection usually most marked at the *apex,* but not so in the others. In cancer, dulness frequently *extends across the middle line. f.* It is important to make thorough examination for the presence of a *tumor in the chest,* which might, by causing pressure on the bronchus, lead to collapse; and also to look for *other signs of pressure,* which are generally present in cancer. *g.* The *progress* and *duration* will usually help considerably in doubtful cases.

5. Sometimes there is a difficulty in distinguishing between *chronic bronchitis* and *phthisis,* when the former is attended with profuse purulent expectoration and wasting. The *slow progress* and *comparatively slight degree of emaciation, absence of fever, non-*

occurrence of hæmoptysis, and *absence of physical signs of consolidation followed by cavities*, will serve to characterize mere bronchitis in the majority of cases, but it must be borne in mind that it may end in phthisis. For the diagnosis of the *different forms of phthisis from each other*, which is often difficult, reference must be made to the account given in alluding to its *varieties*.

6. It may be necessary *to determine the nature of any fluid in the pleura*, and the cause of its presence, and here it must be mentioned that fluid may find its way *from the abdomen*, as from an abscess of the liver or kidney bursting through the diaphragm. There will then have been previous symptoms indicative of these conditions. With regard to the determination of the *nature of the fluid in the case of pleuritic effusion after inflammation*, it is impossible to come to any positive conclusion without making use of the *exploring trocar*, and obtaining some of it for examination. Mere *hydrothorax* is distinguished from *inflammatory effusion* by the following characters: *a.* It is usually a part of *general dropsy*. *b.* Fluid exists on *both sides, but not in excessive quantity; accumulates in the lower part of the pleuræ, pushing down the diaphragm, but not displacing the mediastinum and heart as a rule; and is freely movable.* *c.* There are *no friction phenomena*. *d. Pain* and *tenderness* are *absent*, but *dyspnœa* is generally *very severe*. *e.* There is *no pyrexia*. *Hæmothorax* is characterized by the circumstances under which it occurs, and signs of loss of blood. If there is any uncertainty, the trocar should be employed.

7. It must be mentioned that symptoms and signs may occur in connection with the lungs from certain morbid conditions not originally associated with these organs, such as from rupture of hydatids of the liver into the lungs, or hepatic abscess, hernia of the stomach through the diaphragm, &c.

CHAPTER XIX.

DISEASES OF THE CIRCULATORY ORGANS.

Clinical Phenomena connected with the Heart and Pericardium.

The evidences of disease in connection with the central organ for the circulation of the blood are necessarily not confined to this part alone, but must be more or less apparent throughout the entire system. In the succeeding remarks a summary of the clinical phenomena which may be observed will be given, which will indicate the course of investigation to be pursued It is essential to notice, however, at the outset, that most grave organic cardiac disease may be present without there being any evident *symptoms* to indicate this; and, on the other hand, apparently serious disturbance may exist about the heart, which is entirely *functional*. Further, other diseases are often associated with cardiac affections, especially *renal* and *pulmonary*, which will greatly modify the symptoms.

1. Various *subjective sensations* are often experienced about the cardiac region, viz., pain, oppression, dragging, sinking, or unpleasant sensations associated with the movements of the heart, such as palpitation, irregularity, jogging, rolling, falling back, jumping into the throat, intermittency, or complete stoppage. These are sometimes attended with extreme distress and dread of death. There may be tenderness, or relief from pressure.

2. The *action of the heart is frequently disturbed*, being feeble almost to cessation, excited, palpitating, irregular, or intermittent.

3. Symptoms may be produced *by excessive action of the heart*, especially about the head and face, there being dull heavy headache, with sense of fulness and rushing of blood, throbbing sensations, giddiness, noises in the ears, flashes and specks before the eyes, flushing of the face, heat of head, &c. In short, there are the signs of *active congestion*, and it may even terminate in rupture of the vessels of the brain, or epistaxis. When the *right ventricle* is acting excessively, there are the symptoms of active congestion of the lungs.

4. On the other hand, *deficient cardiac action gives rise to special symptoms*, due to an insufficient supply of arterial blood, viz., those of actual *syncope;* or attacks of an apoplectic or epileptiform character; or merely a state of habitual want of vigor and incapacity for any exertion, with

ness, clamminess, and pallor, especially of the extremities, and a ency to faintness.

A most important class of phenomena results from *a mechanical in- rence with the circulation of the blood*, in consequence of which the onary or general venous system, or both, become overloaded, this also associated commonly with *imperfect oxygenation of the blood deficient supply to the arteries*, the latter causing a marked anæmic rance. When the pulmonary circulation is involved, congestion e lungs, bronchial catarrh, œdema, or even hemorrhage may result, the usual symptoms of dyspnœa, cough, either short and dry, or bronchitic or watery expectoration, or even hæmoptysis. If long nued, the congestion will lead to thickening; or atheromatous or reous degeneration of the pulmonary vessels; proliferation of cel- tissue in the lungs, with excessive formation of pigment; or emphy-

It is necessary to allude to the characters of *ordinary cardiac œa or asthma.* It resembles that of exertion, being more or less ed, panting, or gasping, and noisy. It is subject to much variation. liable to come on in very severe paroxysms, breathing being quite in the intervals, the fits occurring particularly after any effort, es- lly ascending heights, or when the patient lies down or falls asleep. *ct of respiration is not interfered with*, hence it is not very frequent, expiration prolonged, as in emphysema, and the respiratory move- s and sounds are quite free. Of course, if the lungs are involved, haracters of the breathing will be modified accordingly, and true *hial asthma* may occur. A peculiar form of breathing has been de- ed by Cheyne in fatty disease, in which it becomes gradually hurried deeper, up to a certain point, and then subsides by degrees, being wed by a momentary cessation of breathing and dead silence. *In- tary sighing* is occasionally observed.

hen the *general venous system* is obstructed, the various tissues and s of the body become mechanically congested, and the consequences is stagnation follow, viz., serous effusion; permanent enlargement pillaries; increase of connective tissue, with thickening and con- tion; or rupture of vessels, with hemorrhage. It is necessary to der in some detail the symptoms resulting from these morbid con- ns: *a.* As the result of the *general venous plethora*, the patient pre- a more or less cyanotic appearance, especially about the lips, fingers, toes, with pallor from deficient supply of arterial blood. In time face becomes puffy and bloated, and the finger ends clubbed. The ient feels chilly, and is deficient in vitality and vigor, being disinclined any exertion, languid, apathetic, and easily fatigued. Sooner or later y sets in, usually beginning in the feet and ankles and extending wards, ending in general anasarca with serous effusions. As a rule it radual in its onset, and often subsides temporarily under appropriate treatment; in some instances, however, it is rather rapid in its appearance, and then relief may follow as regards chest symptoms. If general cardiac dropsy comes on rapidly, it is usually more easily got rid of, and less likely to return soon, than when it is gradual in its progress. In connection with the venous congestion and dropsy, cutaneous lesions are liable to be set up in the legs, viz., erythema, erysipelas, eczema, rupture of the skin, sloughing, or chronic ulceration. *b.* Some very striking symptoms are due to the disturbance of the circulation in *the central nervous system*. These are dull, heavy headache; sensations of giddiness and unsteadiness; sleepiness, sleep, however, being disturbed by startings, and most unpleasant dreams; mental obscuration, with irritability, want of resolution and stability, indisposition to mental effort, and impairment of the intellectual powers generally; disturbances of vision and hearing, there being also in time objective changes in connection with the eyes; curious sensations or twitchings in the extremities; ultimately gradual sopor, ending in complete coma, may set in, or apoplexy or ventricular effusion might occur. *c.* The *digestive* and *assimilative organs* also readily suffer, as a rule. The *tongue* is full, large, congested, and marked with the teeth, the mouth and throat being also often the seat of venous congestion. In connection with the *stomach*, catarrh, with increase of mucus, occurs, tending to dyspepsia, *sensation of fulness in the epigastrium*, flatulence, eructations, and deficient or depraved appetite. From the condition of the *bowels* result constipation, diarrhœa, or an alternation of these symptoms, and, in time, hæmorrhoids are originated. The *liver* is at first congested, being enlarged, and a certain amount of jaundice often being evident, which is partly due to congestion of the mucous membrane lining the ducts. The bile also is liable to be unhealthy, owing to an admixture of mucus from the gall-bladder, and this increases the difficulty of digestion. Ultimately the liver may become the seat of one form of *cirrhosis*. After a time the *spleen* tends to become permanently enlarged. *d.* Undoubtedly the *kidneys* may be involved, becoming congested, and probably finally cirrhotic; hence at first the *urine* is deficient in quantity, dark, concentrated, and of high specific gravity, deposits urates, and contains more or less albumen, as well as, in some cases, casts. There may be pain and tenderness in the renal region. Catarrh of the bladder occasionally occurs. *e.* From congestion of the *genital organs*, symptoms commonly occur in females, viz., menorrhagia, metrorrhagia, leucorrhœa, and possibly metritis. In males there is a diminution in sexual power and inclination, and prostatic enlargement or hydrocele have been supposed to be due to cardiac affections occasionally.

6. Very dangerous symptoms may be produced in connection with heart disease, *from the formation of clots and other matters in its cavities*, portions of which are either conveyed into the circulation as *emboli*, pro-

ducing local symptoms of obstructed arteries, or give rise to general contamination of blood.

7. In exceptional instances, certain conditions of the heart or pericardium may originate symptoms, *by causing pressure on neighboring structures.*

8. Cardiac affections will necessarily influence greatly the *state of the pulse,* from which most important information may be gained. In all cases, therefore, this ought to be thoroughly investigated, in all the particulars to be presently described, and it is requisite also to examine carefully, in order to determine *whether the arteries are in a condition of degeneration or not.*

9. In rare instances dangerous symptoms are due to *rupture of the heart,* and consequent escape of blood.

CLINICAL PHENOMENA CONNECTED WITH ARTERIES.

1. Occasionally there may be *pain* or *other sensations,* such as *throbbing, tension, &c., associated directly with some diseased condition of an artery,* and *tenderness* is not uncommon.

2. *Pressure on neighboring structures* produces an important class of symptoms in connection with *aneurismal dilatation of arteries.* It is only when they occur in the chest or abdomen, however, that they come specially under the notice of the physician. At present only those symptoms due to *pressure within the chest* will be considered. They may result from the pressure of *any mediastinal tumor,* and therefore the description here given will apply to all forms of mediastinal enlargement, it being borne in mind that the exact symptoms present must necessarily depend upon the actual situation, shape, size, direction, and rate of growth, and other characters of the tumor; that it is rare for the whole of those mentioned to be observed in the same case; and that they are liable to change, owing to an alteration in the direction of growth or other causes. The modes in which pressure contributes to the production of symptoms may be summed up generally as follows: *a.* By causing *displacement,* as of the heart, trachea, or large vessels, and *altering the relation of orifices. b.* By *pressing upon hollow tubes or organs,* and obstructing them to a greater or less degree, *e. g.,* the air tubes, œsophagus, great vessels, thoracic duct, heart. *c.* By *compressing the substance of organs,* and thus preventing the performance of their functions, *e. g.,* the lungs. *d.* By leading to *actual destruction of tissues,* as of the chest-walls, spinal cord, walls of hollow tubes, pericardium or heart, lungs, nerves. *e.* By *irritating nerves,* or *causing paralysis of them,* symptoms being often thus produced *at a distance from the seat of mischief. f.* By *exciting local inflammation,* ending in exudation, adhesions, suppuration, &c.

Such being the *general effects* of pressure, the *special symptoms* produced may be considered, according as it tends in an outward (*centrifugal*), or an inward (*centripetal*), direction.

(i.) *Centrifugal Symptoms.*—In addition to obvious *physical signs*, pressure on the parietes of the thorax will cause *pain*, either neuralgic, or due to inflammation of various structures, or to destruction of bone, when it tends to be heavy, grinding, and gnawing. When neuralgic it often shoots in various directions, as up along the neck or down the arm. There may be merely a sense of weight and oppression, or heat, or indefinable feelings, there being sometimes extreme hyperæsthesia. Tenderness is often present. Actual *paralysis of nerves* may ultimately be produced. If the vertebral column is eaten through, symptoms associated with the *spinal cord* are produced, first those of irritation, and subsequently of destruction.

(ii.) *Centripetal Symptoms.*—*a.* Pressure on the *right side of the heart* or *pulmonary artery* will interfere with the supply of blood to the lungs, and thus aid in causing *dyspnœa*, while it leads to *general overloading of the venous system*. The *action of the heart* is very liable to be disturbed when it is pressed upon. *b. Obstruction of the main arteries*—innominate, carotid, or subclavian—*will alter the characters of the corresponding carotid or radial pulse, diminishing its fulness and force*, or *delaying it*. *c.* Most important symptoms result from *pressure on the large systemic veins*, usually the superior vena cava, either innominate, or the vena azygos, major. *Very rarely* is the inferior cava interfered with. Venous congestion, œdema, enlargement of capillaries and veins, coagulation in them, or actual rupture follows, the nature and extent of the symptoms necessarily depending upon the vein which is obstructed, being *usually* confined to the head, face, neck, chest, and arms, and either bilateral or unilateral. The face, especially the lips, is often puffed and livid, presenting distended capillaries. The neck may be full, thickened, and tumid-looking, having a peculiar spongy or elastic feel, somewhat resembling that of erectile tissue. The throat is often congested and forms much secretion. More or less severe *cerebral symptoms* are produced by the venous congestion of the brain, and *deafness* is sometimes complained of. If the vena azygos is pressed upon, there are signs of *spinal congestion*, viz., sensory and motor disturbances in the lower part of the body. Should the inferior cava be interfered with, there will be anasarca of the legs and abdominal walls, accompanied with signs of obstruction in the abdominal circulation. *d.* Rarely the *pulmonary veins* are compressed, causing pulmonary congestion and its consequences. *e.* The various morbid conditions set up in connection with *the main air-tubes or lungs*, will cause more or less severe dyspnœa, cough, hæmoptysis, alterations in voice, &c. Frequently *marked laryngeal symptoms* are present, either due to pressure, chronic laryngitis and ulceration (which may be the result of *mere irritation of the nerves*), or functional disturbance. There will then be the paroxysmal dyspnœa with stridulous breathing, laryngeal cough, change in the voice, &c., as described under laryngeal affections. When hæmoptysis occurs, the blood sometimes resembles "currant jelly." *f.* From *œsophageal obstruction*, dysphagia partly results, and if food cannot be taken, emaciation necessarily follows. Rarely hæmatemesis takes place. *g. Extreme emaciation* is said to be the consequence of *obstruction of the thoracic duct.* *h. Pressure on nerves* originates numerous phenomena, some of which have been already noticed. Disturbance of the *vagus nerves*, or *pulmonary plexuses*, interferes with breathing and cardiac action The *recurrent nerves*, especially the left, are peculiarly liable to be pressed upon, thus severe laryngeal symptoms and dysphagia being produced. Pressure on the *phrenic nerve* will disturb the action of the diaphragm. *Diminution in the size of the pupil of the eye*, or, more rarely, *dilatation*, depends upon more or less disturbance of the *sympathetic.* Some of the nerves forming the *brachial plexuses* are, in exceptional instances, so pressed upon as to induce paralysis in the arm, and pressure on the *intercostal nerves* causes paralysis of the corresponding muscles.

I may be allowed to digress here to draw attention to the *absolute necessity* of an intelligent knowledge with regard to the *medical anatomy* of the thoracic contents, as well as of the *functions* of the various structures, before the symptoms due to pressure can be at all comprehended.

3. *Obstruction of an artery* will lead to symptoms dependent upon the *want of a proper supply of arterial blood* to the part to which it normally conveys it. These will vary according to the organ or part which is thus deprived, and the degree and rapidity of obstruction. If sudden and complete, it will lead to immediate cessation of functions, and thus may induce serious symptoms, as in the case of the brain vessels, in connection with which it produces immediate loss of consciousness, hemiplegia, &c.; or when the main artery of a limb is blocked up, which is followed by paralysis. If more gradual it causes anæmia, diminution of temperature, depression of functions, and deficient nutrition, which may end in softening or actual gangrene. The *pulse* also is more or less weakened to complete extinction in the arteries which receive their blood from that which is obstructed, while in the portion of this nearer the heart there is increased pulsation.

4. Diseased conditions of arteries may *originate emboli*, or produce substances which contaminate the blood, thus giving rise to *symptoms of obstruction in other parts*, or *to general symptoms indicating septicœmia.*

5. Serious phenomena, both *local* and *general*, will necessarily attend the *rupture of an artery.*

6. *The Pulse.*—*To observe the pulse* has always been looked upon as one of the first duties of a medical practitioner, and justly so. It gives invaluable information in general diseases and various affections connected

with other organs, which influence the heart and vessels, as well as with regard to their own special morbid conditions.

Determining the characters of the pulse is really a mode of *physical examination.* Usually the *radial artery* at the wrist is made use of, but it is often advantageous to look to other arteries, such as the brachial, temporal, or carotid, and when investigating *local conditions*, special vessels must of course be attended to. The *methods of examining the pulse* are by *inspection*, *palpation*, and *the use of the sphygmograph*, and the points to notice are: (*a*) *its visibility or invisibility*; (*b*) *frequency*; (*c*) *quickness* (sharp, abrupt, slow); (*d*) *volume* (large, full, small, thready); (*e*) *force and degree of resistance or tension* (strong, weak, extinct; soft, hard; compressible, incompressible; equal or unequal); (*f*) *rhythm* (regular, irregular, intermittent, lagging behind cardiac systole, continuous); (*g*) *special characters*, both to sight and touch (rigid, tortuous, bounding, hammering, jerky, undulating, with sense of sudden subsidence, vibrating or thrilly, tremulous, dicrotic, or reduplicate). (The term *dicrotic*, when applied to the pulse as *felt by the finger*, means that it has a sensation of being *doubled;* now, however, it is used to indicate a *special character of the pulse* as brought out by the *sphygmograph.*) *h. Sphygmographic tracings.* *i.* It may be useful to *observe the effect of change of posture* upon the pulse, and *comparison of its characters on opposite sides* is often serviceable in diagnosis.

ON THE SPHYGMOGRAPH.

Only a brief outline of this instrument can be given, and for fuller information reference must be made to the standard physiological works, and to the writings of Marey, Burdon-Sanderson, Anstie, and Foster, of Birmingham, on the subject. It is of little use describing the *sphygmograph* at any length, as it must be seen in order to be properly understood, but it may be stated what it essentially consists of. An elastic steel spring, of sufficient strength, is provided on the under surface of one end with a convex piece of ivory, which is placed over the artery, the other end being fixed to the framework of the instrument. By a certain arrangement, the movements produced in this spring by the artery are transmitted to a narrow lever, moving on a pivot, and long enough to amplify them considerably. At the free extremity of this is a little pen, made of flexible metal, which records the motions, by producing a tracing either on a piece of glazed paper by means of ink, or on smoked glass. Either of these is made to travel quickly and steadily in a certain direction, by the aid of an apparatus with clockwork, which is wound up, and the plate can be started or stopped at will by a regulator. As it passes along, the pen traces upon its surface the movements communicated from the pulse through the spring.

A *sphygmographic* tracing is generally taken over the radial artery, the apparatus being fixed on the front of the forearm, with the end of the spring over the artery near the wrist, being kept in its place by elastic bands passing round the forearm, the back of which rests on a pad. It is no easy task at first to fix the instrument so that the pulsations are rendered evident; and to regulate the pressure on the artery, so that it shall not be too great or the reverse, and that thus the movements may be made visible in their maximum degree, which is effected by means of a screw, and is a matter of much importance.

Description of a Sphygmographic Tracing.—The entire tracing, of which Diagram 1 is intended to give a general idea, is made up of a series of *curves* or *pulsations*, each of which corresponds to a complete revolution of the heart's action. It is necessary first to study the characters of an *individual typical curve.* It may be described as consisting of a *systolic* and *diastolic* part, corresponding respectively to the period of contraction and dilatation of the ventricle; or may be divided into: (*a*) *line of ascent*; (*b*) *summit*; (*c*) *line of descent*, in which are two, or sometimes three, *secondary waves*, with intervening notches, named *first* or *distension wave*; *second* or *great wave*, or *true dicrotism*; and *third*, which lies between the other two, but is usually absent. In order to explain these, it is necessary to point out certain facts in the physiology of the circulation (of which the sphygmograph has given far more accurate knowledge than was previously possessed), and indicate the connection of each with the various parts of a pulse-curve. It will be well to take them in the order in which they occur, and their relation to the different parts is indicated in Diagram 2. 1st. *The ventricle contracts more or less suddenly, opening the aortic valves, which give an impulse to the blood in the arteries;* thus is produced the *line of ascent*, *summit wave*, or *percussion impulse* (*a* to *b*). 2d. After this sudden vibration, *the arterial walls partially collapse*, which is indicated by the *first part of the line of descent*, ending in the *first notch* (*b* to *c*). 3d *A wave of blood next passes out of the heart into the aorta*, and this gives rise to the *first secondary wave*, *wave of distension, or systolic pressure* (*c* to *d*). 4th. After this there is *a reflux of blood towards the heart, by which the aortic valves are closed*, which corresponds to *the portion of the line of descent from d to f*, ending in the *great* or *aortic*

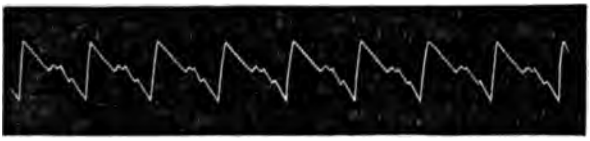

DIAGRAM 1.—Sphygmographic Tracing.

notch (*f*). 5th. During this reflux, *a vibration may occur*, producing *the third secondary wave* (*e*), which is placed, as it were, *in the aortic notch*, and which, as already stated, is generally wanting. 6th. The *aortic valves are then suddenly closed by the pressure of the reflex current of blood*, and thus is originated the *great secondary wave* or *true dicrotism* (*f* to *g*). 7th. Finally, *the blood flows onward in the vessels*, this corresponding to *the remainder of the line of descent* (*g* to *h*); after which the ventricle contracts again, and the same series of phenomena is repeated.

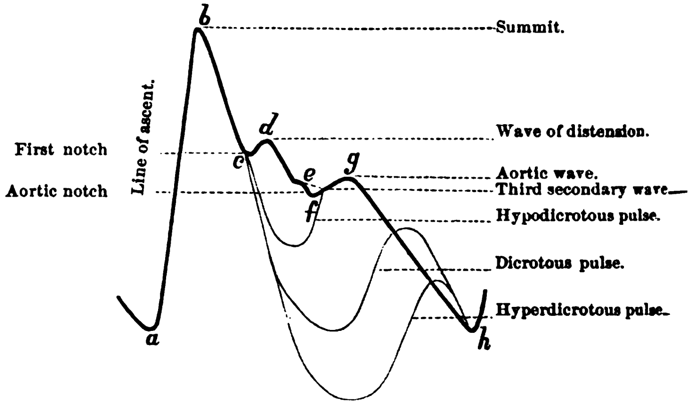

DIAGRAM 2.—Enlarged Sphygmographic Curve.

It will be seen, by studying this description, that the *systolic portion of the curve* extends from the *beginning of the line of ascent* to the *bottom of the aortic notch* (*a* to *f*), during which the ventricle is either *contracting* or *contracted*; *the rest of the line of descent* corresponding to the *diastole*.

In observing a pulse-tracing, the following are the particulars to be noted: 1. The *number of the pulsations* on the tracing, which gives the *exact frequency* of the pulse. 2. With regard to each curve: *a*, the *length of the line of ascent*, and whether it is *vertical or more or less oblique*; *b*, the *shape of the summit*, whether it is *acute*, *rounded*, or *square*; *c*, the *presence*, *size*, and *position* of the *secondary waves*; *d*, the *direction* and *length* of the *part of the line of descent beyond the aortic wave*, and if there are any *undulations* in it. 3. *The relative characters of the curves in a tracing*, especially their *height* and *depth*, observing whether their summits and bases are on the same level or not, which may be determined by drawing a horizontal line along the top and bottom of the tracing, these being respectively the lines of the greatest and least arterial tension. In this way the *regularity* or *irregularity* of the pulse is determined with precision.

The conditions which chiefly modify the sphygmographic tracing are: 1. The *rapidity* and *force* of the *ventricular contraction*. 2. The *degree* of *arterial tension or resistance*, which is influenced by the condition of the walls of the vessels; the controlling effect of the nerves upon them; and the degree of difficulty in the onward passage of the blood, either in the distal part of the artery itself, or through the capillary circulation. 3. The *quantity of blood sent into the vessels*, which is to some extent dependent upon the *duration of the interval between the pulsations*, as, if this is long, the blood flows onward, and thus the quantity in the arteries is diminished, and the pressure lessened. 4. *The volume of the artery.* 5. *The condition of the aortic valves.*

The *more rapidly* the *ventricle contracts*, the *more vertical* will be the *line of ascent*, while the *height* of this is in proportion to the *force of contraction.* If the *ventricle is acting feebly* the *summit is more rounded. High arterial tension* tends *to diminish the height of the line of ascent, and render it more sloping;* to make the *first secondary wave* proportionately *more developed*, and *to raise it* until it ultimately becomes blended with the apex, making this *round or square; to do away with all minor waves; to lessen the aortic wave;* and, if there is obstruction to the onward passage of the blood, *to make the remainder of the line of descent slightly convex upwards*, and to *shorten it. Low tension* produces the opposite effects, and is often attended with *vibratory undulations in the line of descent*, it being only when this condition exists that the *third secondary wave* is observed.

A healthy pulse-curve has a *line of ascent* nearly vertical, and of moderate height, an acute summit, a gradual descent, with usually only the *distension* and *aortic* secondary waves. This form of pulsation is sometimes called *tricrotous*, because it has *three* waves. It must be remembered that physiological variations of the pulse-tracing will arise from taking food or alcohol, overexertion, external heat, severe emotion, &c.

Certain terms are used in describing sphygmographic curves, which it is requisite to notice. When the *first secondary wave* is absent, or nearly so, the *aortic notch deep* (owing to the closure of the valves being delayed), so that it is *on a level with the base of the curve*, and the *aortic wave prominent*, the pulse is called *dicrotous*. (See Diag. 2.) It indicates very low arterial tension. A less degree of this is named *hypo-* or *sub-dicrotous*. A greater degree, so that the *aortic notch sinks below the level of the curve basis*, the aortic wave forming part of the line of ascent of the next pulsation, is termed *hyperdicrotous*. *Monocrotous* signifies that there is *only the primary wave;* and *polycrotous*, that there are a *number of undulatory vibrations*.

The Uses of the Sphygmograph in Disease.—Undoubtedly the sphygmograph gives us much more exact and accurate information with regard to the circulation than can be obtained by merely *feeling the pulse*, especially with respect to the *action of the heart* and *the arterial tension*, wh[illegible] it reveals irregularities and inequalities which cannot otherwise be [illegible]d tected. It is employed for purposes of *diagnosis* and *prognosis*, and for i[illegible] dicating *treatment*. Its *diagnostic* value has, by different observers, b[illegible]e advocated in *aortic disease*, especially *regurgitation*, *cardiac hypertrop*[illegible]*hy*, *senile degeneration of arteries*, as well as *capillary disease associated* [illegible]*it* *degenerative processes in tissues*, and *aneurisms*, it being necessary in [illegible]h last case to compare the pulses on the two sides. The characteristic [illegible]eatures will be pointed out under the several diseases.

For *prognostic* and *therapeutic* indications, the instrument is v[illegible]ry useful in fevers, and other acute diseases, such as delirium tremens, p[illegible]ricarditis, pleurisy, &c., especially by comparing the tracings with [illegible]he temperature. Among the principal dangerous signs are a marked dic[illegible]rotous, hyperdicrotous, or monocrotous pulse; great inequality and irre[illegible]gularity; or a small curve, the ascent being short and not vertical, wit[illegible]h a rounded or square summit.

CLINICAL PHENOMENA CONNECTED WITH THE VEINS.

1. There may be *pain*, *tenderness*, or *cutaneous redness* in the co[illegible]rse of veins. 2. When veins are obstructed in any way, there will be [illegible]he signs of this already described, varying in extent and situation acc[illegible]rding to the vein involved 3. Emboli may originate from clots in ve[illegible]ns.

It will be convenient to consider in this chapter certain functional [illegible]derangements connected with the heart, in which some of the sympt[illegible]ms already alluded to will be treated of more in detail.

ANGINA PECTORIS—SUFFOCATIVE BREAST-PANG.

This is the only affection belonging to the *subjective sensations* ab[illegible]out the heart, which requires special notice. It is characterized by extre[illegible]ely painful sensations, with a sense of impending suffocation.

ETIOLOGY.—Angina pectoris is supposed to be a *neurotic affection*, [illegible]associated with the *cardiac plexus*, and accompanied with, according [illegible]to some, *spasm*, according to others *paralysis* of the muscular tissue of [illegible]he heart. In the large majority of cases it supervenes upon some *orga*[illegible]*nic disease* of the heart or pericardium, but not invariably, while it is [illegible]ot confined to any particular morbid conditions, though most commo[illegible] in connection with *extensive atheroma* or *calcification of the coronary arter*[illegible]; *fatty degeneration of the heart*; and *flabby dilatation*. The *exciting ca*[illegible] of an attack may be *centric*, *e. g.*, emotion; *reflex*, as from dyspepsia, cold, straining; or, probably, some *intrinsic* disturbance of the cardiac gangli[illegible]. Certain distinct *predisposing causes* have been made out, viz., *the male sex;* decidedly *advanced age*, the complaint being rarely observed under 45 or 50; and a *high social position*.

SYMPTOMS.—An attack of *angina pectoris* comes on, as a rule, with *rupt suddenness*, but warnings of its approach are occasionally present, the way of curious sensations or slight pain about the cardiac region. he first paroxysm generally takes place while the patient is *walking up hill, against the wind after a meal, and especially after breakfast.*

The chief symptom is an *intense pain* in some part of the præcordial gion, which may amount to the *most excruciating torture*. In character may be shooting, plunging, tearing, aching, gnawing, sickening, burn-g, &c , but is often indescribable. At the same time a sense of *oppres-n* or *constriction is felt across the chest*, as if it were being forcibly com-essed and could not expand, attended with a *sense of suffocation* and *ability to breathe, though this act is not really interfered with*, and there not the least indication of cyanosis. If a deep breath can be taken and ld, this may relieve the pain. Usually *no tenderness is experienced*, ut rather relief from pressure, though occasionally tenderness over the ernum and adjoining spaces is complained of. Frequently painful sen-tions shoot from the heart in various directions, such as down the left m, even to the fingers, or sometimes the right, up the left side of the ck, backwards, or round the side.

There is evidence of grave disturbance of the system. The face becomes le, covered with cold sweat, and the expression is one of intense anxiety, arm, and dread of impending death. In most cases the pulse tends to come feeble, and even fluttering or irregular if the attack is prolonged. uch will depend on the condition of the heart with which the angina associated, and this is also true as regards the *physical signs*. Occa-onally vomiting and eructations accompany the attack. The patient is uite conscious at first, but in prolonged or fatal cases may fall into a ate of syncope, and spasmodic movements or even general convulsions ay be observed.

Usually an entire attack consists of several brief paroxysms, with in-ermissions, but there may be only one; the morbid sensations generally ase suddenly, this being attended with a sense of extreme relief, though here is a feeling of exhaustion afterwards, which may last some time. ery rarely does the first attack prove fatal, but it may do so, either uddenly or gradually. Probably some cases of sudden death are due to ngina. A marked character of the complaint is its *great tendency to ecur* under the influence of very slight exciting causes.

A form of angina pectoris is described, which is not attended with pain -*Angina sine dolore*. Here also an affection may be alluded to, named *eudo angina pectoris*, which is common among young persons, and at-nded with sudden pain and unpleasant sensations about the heart, pal-itation, disturbance of breathing, faintness and giddiness, pallor of the ce, and feeble pulse. The condition of the patient may appear to be ally serious, but very rarely does a fatal termination occur. This com-

iiefly observed in connection with anæmia, various nervous
especially hysteria, or blood-diseases, such as gout.
sis.—*True angina pectoris* is a very dangerous complaint, but
h simulates it is not; therefore it is important to distinguish
them. The presence and nature of any organic cardiac disease
essarily influence the prognosis materially. e
TMENT.—1 In order to *prevent attacks*, any one who is subject to o
should avoid every possible exciting cause, and it is desirable to o
some remedy in the pocket, especially *opium*, so that it may be oe
use of immediately there is the least indication of the approach of of
oxysm. 2. *During an attack* any obvious source of reflex disturb o-
, such as indigestible food, must be at once removed. The important nt
ernal remedies are sedatives, antispasmodics, and stimulants, especially ly
um in full doses, hydrate of chloral, various ethers, chloroform, am- n-
onia, musk, camphor, hot brandy and water, &c. Digitalis and bell a-
onna are also recommended. Inhalations of chloroform, ether, or *nitri* *te*
f amyl might be tried carefully in bad cases. The last has been ver y
well spoken of. *Local applications* of *dry heat*, *with friction*, sinapism ns
or friction with chloroform or belladonna liniment may be useful. Gent le
galvanism has been recommended. In a gouty person the joints of th e
feet should be irritated. 8. *During the intervals* the treatment is th at
which applies to cardiac affections in general, in the way of attending to
the digestive organs, to the general and constitutional condition, and th at
of the blood, as well as to all hygienic matters. Tepid or cold baths fol-
lowed by friction, and change of air and scene are often beneficial. A
belladonna plaster may be worn constantly over the cardiac region.

For *pseudo-angina* similar remedies are indicated during a paroxysm,
but they need not be so powerful. At other times the treatment must be
directed to the state of the patient.

SYNCOPE.

Mention has already been made of this condition, when alluding to th
general modes of death. The phenomena associated with it are due pr
marily to a failure on the part of the heart, which is speedily followed
disturbance of the nervous centres, due to anæmia, and this by fail
pulmonary functions.

ETIOLOGY.—The chief *predisposing causes* of syncope are early
age; the female sex; a nervous temperament; and a state of wea
with poor quality of the blood. *Exciting causes.* Among the cause
mentioned are some which seem to lead to a condition allied to "
in which the three chief systems are almost simultaneously
though probably the nervous centres are first disturbed. It is no
easy to determine whether a case should be classed as one of sy

shock. The causes may be arranged under the following heads: 1. *Want of blood in the cavities of the heart*, from rupture of its walls or a great vessel, or severe hemorrhage from any cause; obstruction in the principal veins; or sudden removal of pressure from the great vessels, as when syncope follows paracentesis abdominis for ascites. 2. *Inadequate supply of blood to the cardiac walls*, as from obstruction of the coronary arteries; or *a supply of impure blood*, as in low fevers, or when syncope comes on in a hot and crowded room. 3. *Partial or complete paralysis of the muscular tissue of the heart*, either from some *organic change*, or from *nervous disturbance*, centric, reflex, or intrinsic. Numerous causes act in this way, such as fatty and other degenerations of the heart, flabby dilatation, or a weak state of this organ in certain chronic diseases, *e. g.*, cancer, phthisis, &c.; sudden reflux of blood in aortic regurgitation; various poisonous substances (aconite, tobacco, prussic acid, antimony, &c.); strong emotion and severe cerebral lesions; long continuance in a warm bath; reflex disturbance from bad smells, or unpleasant sounds; pain of any kind; extensive burns; passage of a catheter; a shock to the sympathetic, as from a blow in the epigastrium; drinking cold water when heated; taking indigestible food, or overeating after fasting, &c. Lightning sometimes produces death in this way. 4. *Continued spasmodic contraction of the heart*, *e. g.*, in angina pectoris probably. 5. *Mechanical pressure outside the heart*, as in some cases of great pericardial effusion.

ANATOMICAL CHARACTERS.—The state of the heart varies considerably, according to the cause of the syncope. After great loss of blood, it is usually contracted and empty. When the walls are paralyzed, the cavities are dilated and contain more or less blood, either fluid or coagulated. The lungs are usually anæmic, and the nervous centres markedly so.

SYMPTOMS.—Syncope may come on quite suddenly, or even cause instantaneous death. In many cases, however, it is gradual, there being premonitory symptoms before actual insensibility occurs. These are a sense of faintness, giddiness, and trembling, with sinking in the epigastrium, nausea, and sometimes vomiting; pallor, especially of the face with drawn features; chilliness and shivering, or in some cases a sense of heat, but with cold, clammy perspirations; a very rapid, small, and weak pulse, tending to become irregular and slow, though the large arteries may throb; hurried, irregular breathing, or sometimes gasping, often attended with sighing; great restlessness, and occasionally slight convulsive movements; mental confusion, and disturbance of the senses of sight and hearing, in the way of more or less dim vision, extreme sensibility to light, and noises in the ears. When the syncopal state is complete, the symptoms are *absolute insensibility*, with *dilatation of the pupils*; deathlike pallor, with cold and clammy sweats; a slow and extremely weak, irregular, or actually imperceptible pulse; infrequent, irregular respiration, which may ultimately cease altogether. Not uncommonly convulsive movements are observed, and the sphincters may be relaxed, with involuntary discharge of fæces and urine. *Examination of the heart* reveals *feebleness* or complete *absence* of *impulse* and *sounds*, especially the *systolic*.

This condition lasts a variable time, and either ends in death or recovery. In the latter case, usually very uncomfortable sensations are experienced as the patient returns to consciousness, this being often attended with palpitation, vomiting, or convulsive movements.

TREATMENT.—Any obvious reflex cause of syncope should be at once removed. It is most important to attend to the *posture of the patient*, which should be *horizontal*, *with the head low*. Fainting may not uncommonly be prevented by bending forwards, and hanging the head down between the knees as far as possible. All clothes should be loosened, and plenty of fresh air admitted. The application of ammonia to the nostrils; dashing cold water in the face; or friction, either with the hand alone, or with stimulating liniments, along the limbs and over the heart, will often restore vitality. The internal administration of stimulants, such as brandy, wine, ammonia, ether, musk, is most useful, and if they cannot be swallowed, and there is any danger, *enemata* should be employed. Attempts may be made to confine the blood to the central organs, by making pressure on the arteries of the limbs, by the aid of the fingers or tourniquets, warmth being maintained by hot bottles and friction. Sinapisms, or turpentine stupes over the heart should be employed if necessary, and in dangerous cases, *regulated galvanism along the pneumogastric nerves*, *artificial respiration* and *transfusion* are the most potent remedies with which we are acquainted. The last is particularly valuable, if there has been great loss of blood.

PALPITATION.

ETIOLOGY.—Formerly palpitation was regarded as an evidence of *cardiac excitement* and *increased action*, but it is now generally believed to be associated with *a want of power*, and to indicate *laborious effort* on the part of the heart, this organ being taxed beyond its powers. The individuals in whom it is most frequently met with are young adults and persons beyond middle age, females, nervous persons, and fat flabby people, who live highly, take but little exercise, and suffer habitually from dyspeptic disturbances.

Exciting Causes.—Palpitation may occur under a great variety of circumstances, but they are all such as lead to inadequate action on the part of the heart. 1. *Acute or chronic organic disease of the heart or pericardium* is often attended with palpitation. This results either from the muscular tissue being involved, and so more or less paralyzed, or from there being some obstruction to the circulation which the heart cannot overcome. It may even occur in *hypertrophy*, but this is no sign of overaction, but rather points to the fact that the hypertrophy is *insufficiently compensatory*, and frequently indicates commencing degeneration. 2. *Mechanical interference with the cardiac action* is usually accompanied with palpitation, as from tight lacing, distorted chest, displacement by pleuritic effusion, abdominal enlargements, of which flatulent distension of the stomach is a common form. 3. Obstruction to the circulation may depend on *disease in the vessels*, and if there is not adequate compensatory hypertrophy, palpitation is readily induced. Hence it is observed in atheroma, calcification, or hypertrophy of the arterial coats in Bright's disease. 4. *Chronic affections of the lungs*, such as bronchitis and emphysema, which *interfere with the circulation*, are also frequently attended with palpitation. 5. It may depend upon something wrong as regards *the blood*, either in its quantity or quality, *e. g.*, plethora, anæmia, the abnormal condition associated with gout, renal disease, fevers, and, probably, the admixture of materials taken into the system from without. There is a difficulty in driving on the blood under these circumstances, and thus the heart is easily disturbed, while at the same time it is itself supplied with impure blood. 6. Numerous causes act through the *nervous system*, either directly from the centres, or by reflex irritation, *e. g.*, continued cerebral excitement or mental labor; emotion; functional nervous disorders (hysteria, epilepsy, chorea, neuralgia); *the abuse of tea, alcohol, or tobacco;* reflex disturbance originating in the alimentary canal (as from eating indigestible food), or in the genital organs. This *nervous palpitation* is supposed to be chiefly due to *spasmodic contraction* of the arterioles, whereby a difficulty in the passage of the blood is induced. It is very likely, however, that the *innervation of the heart itself* is also disturbed, its action being thus rendered less efficient.

In some cases palpitation is present at all times, more or less, though it is increased by anything which throws extra effort upon the heart, such as slight exertion. In other instances it is only paroxysmal, being brought on by some evident *exciting cause*, or independently of this.

Irregularity is a form of cardiac disturbance often existing alone or accompanying palpitation, and it is a still more serious indication of want of power. It may affect only the rhythm, the force, or both. Rhythmical irregularity is due to a halting, hesitation, or partial arrest of the ventricular contraction, which may be brought about by a disturbance of the balance of power between the vagus and cardiac ganglia, or, more commonly, between the opposition offered to the blood to be driven and the power to drive it (Fothergill). It is often, but not necessarily, associated with grave organic disease, especially dilatation, or with low conditions of the system, such as malignant fevers. The irregularity may appear to be of a hesitating or anticipating character; sometimes it passes through regular cycles, but in other cases the cardiac action seems entirely confused.

termittency is the most advanced evidence of cardiac failure, and nifies that there is a *complete arrest* in the ventricular contractions, til two or sometimes more auricular contractions have occurred, which e required before sufficient blood is sent into the ventricle to rouse it [illegible] nto activity. The conditions with which it may be associated are *fat*[illegible] *legeneration of the heart*; aortic obstruction; hypertrophy and dilatation [illegible]; irritation of the vagus nerve, either at its root from cerebral disease, o[illegible]or in its course from pressure of a tumor; the advanced stages of sever[illegible]are fevers; diseases of the lungs causing great obstruction, the left ventric[illegible]cle being disturbed under these circumstances along with the right; or *me*[illegible]*ere* *nervous disturbance of the heart*. It may even be induced voluntarily, [illegible] by holding the breath.

SYMPTOMS.—*Palpitation* is generally accompanied with increased f[illegible]fre- quency and quickness of the heart's beats, especially when a sev[illegible]ere paroxysm comes on. The action may be quite regular, or attended [illegible]ith various forms of irregularity or with intermittency. There is also frequently some inequality in force. Various unpleasant *subjective sensa*[illegible]*ions* are experienced over the cardiac region, the *patient being conscious* [illegible]*that* *the heart is acting*, and this is associated with a sense of rolling. jogg[illegible]ing, sudden falling back, jumping into the throat, and other indefinable feelings (*præcordial distress or anxiety*). There may be considerable pain, almost anginal, which is relieved in some cases by pressure. During severe paroxysms there are often very serious symptoms, viz., faintness, occasionally ending in actual syncope; dyspnœa, with hurried breathing, and an inability to "catch the breath;" flushing of the face, headache, with a sense of heat, giddiness, disturbed vision, and noises in the ears; cold extremities. Sometimes there is much anxiety and fear of dissolution. The *radial pulse* usually corresponds to the heart's beats, but not always; it is often small and weak, though the heart is acting violently and the large arteries throb, being generally also quick and sharp.

The *duration* and *severity* of a fit of palpitation vary greatly, the sym toms being more severe, as a rule, when there is irregularity. It is of terminated by profuse diuresis of light-colored urine, or a sense of n exhaustion follows, which calls for a prolonged sleep. The palpit due to *drinking strong tea* is sometimes of a very distressing char Occasionally it is *constantly* present in great intensity, without being any organic disease, of which I have seen some well-mark in young women. It is then often a part of Graves's disease (to after considered), but not always.

Physical signs will of course depend upon whether the heart ically affected or not. The signs which may be due to *mere* are as follows: 1. *Impulse* too extensive; often strong, but n may be irregular in rhythm and force, jogging, fluttering, & ness occasionally increased *to the right* in prolonged cases, f *tension of the right cavities with blood.* 3. *Sounds* often louder than natural, with a great tendency to *reduplication.* 4 Occasionally a temporary *systolic murmur* may be heard at the base of the heart, or *at the left apex*, the latter arising from *irregular action of the musculi papillares.*

Intermittent action of the heart is sometimes attended with the most distressing and horrible sensations, there being an intense dread of impending dissolution.

DIAGNOSIS.—The important matter to determine is whether these disturbances of the heart's action are due to *organic disease* or not, and this can only be done satisfactorily by *thorough physical examination*, and by taking into consideration all the general circumstances of the case. The *impulse* of palpitation differs from that of hypertrophy, in *not being heaving.*

PROGNOSIS.—This will vary greatly, according to the cause of the disturbed action, and especially the presence and nature of any organic disease. It must not be thought, however, that *simple palpitation* is harmless, for it may be a very serious matter. Irregularity, or even intermittency, is *not a certain sign of organic disease*, as both these conditions may be associated with mere *functional disorder.*

TREATMENT.—1. *During a paroxysm of palpitation*, the chief measures to be adopted are, to get rid of every source of reflex irritation; to administer antispasmodics, sedatives, and stimulants, such as brandy, ethers, ammonia, opium, or morphia, hydrocyanic acid, henbane, musk, tincture of lavender, galbanum, assafœtida, &c., as well as medicines which *act upon the heart directly*, especially *digitalis;* to apply dry heat or sinapisms over the præcordial region, and heat to the extremities, if required.

2. *During the intervals, or in chronic cases*, it is necessary to look to *the state of the heart, digitalis* being often most valuable for improving its action; to *avert every possible cause of fits*, by removing mechanical pressure, attending to the *diet and digestive organs*, and *habits* generally, *especially avoiding excess in the use of alcohol, tobacco, or tea*, as well as *overstudy* and other forms of mental excitement, and venereal excess; to treat any *constitutional diathesis*, such as gout; and *improve the condition of the system generally*, but especially of the *nervous system and blood*, by giving mineral tonics, mineral acids, quinine, strychnine, or tincture of nux vomica, *various preparations of iron*, and ordering cold baths, with douches and frictions, a proper amount of exercise, change of air and scene into a pleasant climate, &c. A mixture containing *tincture of steel, nux vomica, and digitalis*, is often most beneficial. *A belladonna plaster* may be worn constantly over the cardiac region. The same principles of treatment are applicable to the other forms of cardiac disturbance.

CHAPTER XX.

ACUTE INFLAMMATIONS OF THE HEART AND PERICARDIUM.

I. ACUTE PERICARDITIS.

ETIOLOGY.—Cases of pericarditis, like those of pleurisy, may be classed as *primary* and *secondary*, according to their mode of origin; but the immense majority belong to the latter class. The affection may arise under the following circumstances: 1. *In connection with certain blood diseases*, especially *rheumatic fever* and *Bright's disease*, and occasionally in pyæmia, typhoid, typhus, variola, scarlatina, puerperal fever, gout, scurvy, purpura. It has been stated to result from an impure state of the blood in connection with cyanosis, or after the cure of cutaneous diseases of long continuance.. 2. From injury, such as a wound of the pericardium, or laceration by fractured ribs (*traumatic*). 3. From *perforation*, *e. g.*, a neighboring abscess opening into the pericardium (*perforative*). 4. *By extension of adjoining inflammation*, or *irritation set up by neighboring disease*, *e. g.*, pleurisy, pneumonia, chronic cardiac disease, aneurism of the aorta, abscesses in the vicinity, carious ribs, tumors. In these cases it tends to be localized. 5. From the *irritation of some new formation in the pericardium*, as cancer or tubercle. 6. *Idiopathic pericarditis* has been described, resulting from "cold;" but it is extremely doubtful whether the affection ever arises from this cause.

ANATOMICAL CHARACTERS.—It is unnecessary to describe these at any length, as they are similar to those observed in other serous inflammations, and run a similar course. The *exudation* is generally deposited on both surfaces, but more on the visceral part, as a rule; rarely is it observed over the whole extent of the sac, being usually in patches; it may be confined to a small area, especially about the great vessels. The thickness and mode of deposit are very variable, the lymph being stratified, or present-ng little elevations, ridges, bands, masses, and numerous other rrangements. Usually the material is tolerably consistent, and ometimes quite tough, adhering fairly to the surface. In low onditions it may be soft and granular. The *effusion* is generally ero-fibrinous, containing flocculi, but in exceptional cases it may have blood or pus mixed with it, being in extremely rare instances actually purulent. The quantity is not usually above from eight to twelve ounces, but may range from an ounce or two to three pints or more. Gas is sometimes present, from decomposition. Sloughing of the membrane is said to occur occasionally.

The processes of *absorption* and *adhesion* are precisely identical with those described under pleurisy. The adhesions may be merely in the form of loose bands, or as extensive agglutinations of the two surfaces, and the inflammatory irritation sometimes extends through the pericardium, so as to cause its union with the chest-walls. When about the great vessels, the lymph often leads to their adhesion to one another, and it may remain behind as a hard mass, of considerable thickness.

Allusion may here be made to the so-called "white patches" on the pericardium. As a rule, these are decidedly merely due to friction, but sometimes they are the remnants of inflammation.

SYMPTOMS.—Practically it is in the course of *acute rheumatism* or *Bright's disease* that pericarditis comes under our notice, and *it should always be particularly looked for in these affections, by frequent examinations.* It *may* come on without any evident symptoms, but this is not usually the case, though it must be noted that the clinical phenomena observed will depend considerably on the disease with which the pericarditis is associated, and they are also modified by other cardiac inflammations, as well as by distinct complications, such as pneumonia, which so frequently accompany it.

At the outset *local symptoms* are generally present, viz., *pain, tenderness*, and *disturbed action of the heart.* The *pain* is felt over a part or the whole of the *præcordial region*, occasionally in the *epigastrium*, and sometimes it shoots in different directions; its *severity* and *characters* vary widely, it being described as mere uneasiness, or dull aching, shooting, stabbing, burning, tearing, &c., and it may amount to the most intense suffering. *Tenderness* is experienced, as a rule, over the spaces, and in some instances when upward pressure is made over the epigastrium. The *disturbed cardiac action* is indicated by *palpitation*, sometimes violent. An attack of pericarditis may be ushered in by slight rigors, followed by pyrexia. As it occurs in practice, however, these phenomena are frequently absent, there being no increase of fever previously existing. The *pulse* is necessarily hurried, and may be very frequent.

When fluid accumulates, the pain subsides generally, but the action of the heart is interfered with, as well as the functions of neighboring structures, to a degree proportionate to the quantity of the effusion. Hence grave symptoms may arise, indicating a tendency to syncope, loading of the right heart and venous system, interference with the respiratory functions, or severe nervous disturbance. The *pulse* often becomes very frequent, feeble, small, and in bad cases irregular. Sometimes it is slow and labored. *Dyspnœa* is present, and may be extremely severe, amounting to constant or paroxysmal orthopnœa, with a sense of great oppression across the chest. A dry, irritable, spasmodic *cough*, is not uncommonly observed. In bad cases the face assumes a very anxious and distressed expression, and becomes pale, or more or less cyanotic; the expired air is cool, and the extremities cold. The *mode of decumbency* is generally on the back, with the head high; some patients prefer lying on the left side, others on the right; while occasionally they are obliged to be propped up, or bend forwards. Frequently there is much restlessness, if the patient is not prevented from moving on account of rheumatism. Headache and sleeplessness are common, and among occasional severe nervous symptoms are delirium, which may be almost maniacal, stupor, subsultus tendinum and jactitation, clonic or tonic spasms, choreiform or epileptiform symptoms, and dysphagia. In most cases, however, these probably depend on the *general condition*. Vomiting is sometimes present. Should death take place, it usually results from syncope, *which may be sudden, from making the patient assume a sitting position, when the pericardium is very full of fluid;* interference with the aeration of the blood, and with the circulation, the lung becoming œdematous, and dropsy setting in; or from the nervous disturbance.

PHYSICAL SIGNS.—In the early stages the only reliable signs are: 1. Excited action of the heart, as evidenced by the *impulse*. 2. Pericardial friction-fremitus, which is *extremely rare*. 3. *Pericardial friction-sound*, the characters of which have been already described (page 387). It must be mentioned, however, that *friction-sounds may be absent*, either on account of the soft nature of the lymph, or its being deposited only on one surface, or at the back of the heart.

In the stage of *fluid effusion*, the *physical signs* will be in proportion to its quantity, and are of the following nature: 1. *Bulging of the cardiac region*, especially in young persons. This may extend from the 2d to the 6th or 7th cartilage, the spaces being widened, or even protruded, and sometimes the left edge of the sternum is pushed forwards. *Local measurements* are altered. 2. The *impulse* presents several important changes. *a*. It is *displaced*, usually *upwards and to the left*, but sometimes downwards; *and is altered by change of posture. b. Its force is much diminished*, and the impulse may be *visible, when not perceptible to touch*. Often it can be felt in the *erect or sitting posture*, when absent in the *lying posture*. There is sometimes *great irregularity in force. c. In rhythm* the impulse tends to *be delayed slightly* after the systole; it may be extremely *irregular*. *d*. The *character* is *undulatory*, when there is much fluid, this being observed over a variable area, and being modified by position; the undulations usually appear to pass from below up, and from left to right, but they may have a horizontal direction. 3. *Cardiac dulness* is materially altered in *extent, degree*, and *shape*. *It increases first about the base, and extends upwards, and then laterally*. Usually it does not pass below the 6th rib, but in extreme cases may reach considerably lower than this, the fluid pushing down the diaphragm, and causing protrusion of the epigastrium. In an upward direction it may extend even to the clavicle, and transversely from the right border of the sternum to beyond the left nipple, and a very important character, when the fluid is abundant, is, *that dulness is observed to the left beyond the apex beat*. The *shape* is more or less *triangular*, with the *apex upwards*. The *intensity* of the dulness is d to be unusually great. *Change of posture* will modify it; the ea is larger in the lying than the erect position, but if the mount of fluid is not very great, it extends higher in the latter posture. 4. The *heart-sounds* are more or less *feeble at the apex*, and appear *deep*, but on passing the stethoscope *upwards towards the base*, they become *louder and more superficial*. *Change of posture may influence them.* 5. It is said that a *basic systolic murmur* is heard occasionally, due to *pressure on the aorta*. 6. *Friction-phenomena* often persists for a variable time while fluid is accumulating, becoming by degrees less marked, or being only observed in certain positions. 7. *Pericardial effusion* will necessarily affect neighboring structures, especially the lungs. *Vocal fremitus* and *resonance*, as well as *breath-sounds*, are *diminished* in *area* over the cardiac region; *ægophony* is occasionally heard, above and to the left, and *vocal resonance is intensified on the borders of the dulness*. *Dulness at the base of the left lung* may possibly be observed, from partial *collapse*, owing to pressure on the bronchus. The *liver* and *spleen* are in some cases depressed, along with the *diaphragm*.

Should *absorption* take place, the signs become gradually normal in favorable cases, and it is only requisite to notice that the *dulness diminishes from above and laterally*, and that the *friction-signs return*, usually in an increased degree, the sound also assuming more of the "churning" and "clicking" characters. The phenomena indicating *chronic adhesions* will be hereafter considered.

DIAGNOSIS.—In the early period, the chief matter in diagnosis
is to separate *pericarditis* from *endocarditis*. Symptoms are n
reliable, but *severe local pain* would be in favor of pericardi
The diagnosis, however, must be founded *on the different cha*
ters of the murmur present in each case, being aided occasion
by the existence of *friction-fremitus*. When difficulty is ex
enced, which is not uncommon at first, *the case must be thor*
watched in its further progress. *Pericardial* friction must
mistaken for *pleuritic*, and it should be mentioned that it
be simulated by œdematous integuments, fluid in the media
or the friction of a cirrhosed liver.

The several conditions with which the dulness of p *effusion* might be confounded, will be again pointed out; at present it is only intended to indicate the distinctions between *effusion from inflammation* and mere *hydropericardium*, and in doing so, all important facts in connection with the latter will be considered. 1. In the great majority of cases it is *a part of chronic general dropsy;* it has been stated that it may set in *acutely* in *Bright's disease;* and rare instances have been met with, in which it was *mechanical* in its origin, having come on from *pressure of an aneurism* or *mediastinal tumor*, *disease of the cardiac veins* or *their obstruction by a clot*, or *after sudden extreme pneumothorax*. 2. *There are no severe initiatory symptoms or pyrexia, nor is there any great disturbance of the heart's action.* 3. The *effusion*, which is simply *serous*, is *not abundant*, hence there is *no bulging*, the *physical signs of fluid are less marked*, and the *dulness is more altered by posture.* 4. *Friction-signs are absent throughout.* 5. *Hydropericardium generally follows hydrothorax*, and hence *it is preceded by the symptoms and physical signs of the latter, the effects of which it necessarily tends to aggravate.*

Terminations.—Pericarditis may end in practical *recovery*, generally, however, with some adhesions; *in death;* or by becoming *chronic*, either the effusion remaining, in rare instances becoming purulent, or even pointing; or external agglutinations forming, which greatly disturb the cardiac action. As a consequence, *hypertrophy* or *dilatation* may follow, or, in exceptional cases, *atrophy* or *fatty degeneration*, owing to pressure on the coronary arteries.

Prognosis.—The immediate prognosis will depend on the *condition with which the pericarditis is associated*, it being very dangerous in Bright's disease, for instance; the *amount and nature of the effusion; the previous condition of the heart; the state of the pulse*, as indicated by the sphygmograph; *whether the pericarditis is complicated with other inflammations;* and the *severity and character of the symptoms.* Marked nervous symptoms are of very serious import. The *ultimate* prognosis will be entirely influenced by the conditions left behind; extensive agglutination, or permanent displacement of the heart, owing to adhesions, are untoward events.

Treatment.—The principles of treatment in *pericarditis* are similar to those in *pleurisy*, but as the former occurs almost always in the course of some other complaint, its management has to be modified accordingly. When it occurs during *acute rheumatism*, the treatment for this affection must be persevered in, and *opium* given freely, in order to calm the excited action of the heart, care, however, being taken to avoid narcotizing the patient, should there be cyanotic signs. *Venesection and mercurialization are never admissible.* A few leeches may be sometimes beneficial in robust subjects, but, as a rule, the *persistent application of heat and moisture over the præcordial region, by means of linseed poultices or fomentations*, is the most serviceable local treatment. Great care must be taken that the applications are *frequently changed*, and *that the chest is not unduly exposed and chilled. Cold* is strongly recommended by some observers, as strongly condemned by others; it certainly should only be tried very cautiously. *Aconite, veratria*, and *tartar emetic* have also been given to calm the heart's action, but these are dangerous remedies in pericarditis.

For the *removal of effusion*, blisters, or the application of strong iodine may be tried, if necessary, with diuretics and iodide of potassium internally. *Tincture of iron* is decidedly a valuable drug at this time, and tonics are often useful.

As a rule a good quantity of nourishment is required, and often a little stimulant is indicated; if there is much depression, with a failing pulse, a considerable amount of brandy may be necessary, and *digitalis* is highly spoken of under these circumstances. The patient must not be examined unnecessarily or made to sit up, if there is any danger of syncope.

I have never met with any case even remotely suggesting *paracentesis*, but the operation has in rare instances been required in order to relieve dangerous symptoms, or to remove purulent fluid. Some advocate its more frequent adoption, but, for obvious reasons, it ought not to be rashly practiced. A small suction-trocar is the best instrument for the operation.

In *pericarditis* occurring in Bright's disease or low fevers, free stimulation is usually required, while *opium* is contraindicated or must be employed exceedingly carefully.

II. Acute Endocarditis.

Etiology.—Almost invariably this affection is due to some *blood-poisoning*, especially in connection with *acute rheumatism*, but also in Bright's disease, pyæmia, septicæmia, scarlatina, small-pox, typhoid fever, puerperal fever, and other pyrexial diseases. Probably it results from *direct irritation of the endocardium* by the *poisoned blood*.

Anatomical Characters.—It is rare to see the endocardium in the early period of inflammation, when it merely presents bright redness, usually with distinct points of increased vascularization. Soon the membrane becomes less smooth, swollen, and clouded, loses its polish, and is less consistent. Numerous young cells form in the subepithelial tissue, causing it to become thickened, and also little vascular villi or granulations project on the surface. In some cases the endocardium assumes the appearance of a soft, velvety membrane. *Fibrinous vegetations* are soon formed, which are derived *directly from the blood*, the fibrin of which is deposited on the inflamed membrane, and it may be in strata, or form masses of considerable size. Only the *left cavities* of the heart are usually involved, and it is the orifices and their vicinity, with the valves and their appendages, which are mainly affected. (During *intra-uterine life* endocarditis chiefly occurs on the *right* side.) The *free edges* of the valves are much thickened, especially those parts which are exposed to considerable friction and irritation, and the fibrinous vegetations are chiefly deposited on the surface which is opposed to the current of the circulation.

As occasional events in acute endocarditis, there may be observed fissuring of the membrane, or actual ulceration from softening and destruction of tissue, the ulcers being irregular, superficial, and having thickened edges; formation of pus in the deeper layers, ultimately reaching the surface; perforation, rupture, or extensive destruction of a valve; rupture of one or more chordæ tendineæ, the free ends of which may float in the blood, and lead to the formation of vegetations; or the production of aneurism of the heart.

Emboli are very liable to be detached from the fibrinous deposits, and the evidences of these may be seen in distant organs, or some of the products of inflammation may be conveyed into the circulation and produce septicæmic signs in various parts.

If the inflammatory process subsides, the young tissue develops into an imperfect fibrous structure, and proliferation may go on for some time, thus leading to most serious permanent organic changes, fatty and calcareous degeneration often finally occurring, which increase the damage. This is one of the conditions known as *chronic endocarditis*, but the affection may be chronic from the outset, there being a slow growth of new tissue, which tends to develop into a *fibroid material*. The ultimate changes are similar in both cases, and the chief morbid conditions resulting from them are as follows: 1. Thickening, induration, and puckering of some part of the general tract of the endocardium. 2. Thickening of the valves, with opacity, rigidity, and more or less shrinking, by which they may be greatly narrowed, and rendered incompetent. 3. Adhesion of the tongues of a valve to each other, or to the walls of the heart. 4. Thickening, induration, and contraction of the chordæ tendineæ, or musculi papillares. 5. Narrowing of the orifices, usually attended with irregularity, roughness, and hardening. 6. Formation of firm warty productions, either sessile or pedunculated.

When atheroma and calcification take place, of course the structures present the usual characters which accompany these degenerations.

SYMPTOMS.—Many cases of endocarditis occur, which are *only revealed by physical examination. Local symptoms* are always very indefinite, there being little or no *pain* or *tenderness; palpitation* is frequently present. The characters of the *pulse* have been variously stated by different observers; at first it is usually frequent, full, and excited; afterwards it may become feeble, small, and irregular in force and rhythm, but various circumstances influence it. Increased *pyrexia* may set in in endocarditis, and it tends to assume an adynamic type. The chief symptoms which may arise in its course, however, are those dependent upon (*a*) *interference with the circulation at one of the orifices;* (*b*) *formation of extensive clots in the heart,* causing obstruction, and indicated by extremely frequent and irregular cardiac action and pulse, tendency to syncope, great dyspnœa amounting to orthopnœa in paroxysms, with extreme anxiety, followed by asphyxial symptoms, and severe disturbance of the nervous system; (*c*) *the conveying of emboli* to the spleen, kidneys, brain, &c., or of *deleterious inflammatory products*, the latter giving rise to symptoms of septicæmia.

PHYSICAL SIGNS.—The only *positive signs* are those indicating excited action of the heart, *some disturbance at an orifice*, or extensive coagulation. 1. The *impulse* is *forcible*, and increased in area; if coagulation takes place, it tends to become irregular in rhythm and force. 2. *Increased dulness*, especially to the right, may arise from stagnation of blood and coagulation. 3. The *sounds* are often altered in character, but this is not to be relied upon. 4. The *great sign* is the presence of a *murmur* or *murmurs*, but it must be remembered that these may have previously existed. Different observers have given different statements as to the valvular lesion most frequently present. In my own experience, *mitral regurgitation* has been decidedly the most common condition in *acute* endocarditis, but this may in some cases result from irregular action of the musculi papillares. *Aortic obstruction* is not uncommon. *Pulmonary obstructive* murmur may be present, in connection with coagulation in the right cavities, but on the left side this sometimes interferes with a murmur.

DIAGNOSIS.—In addition to distinguishing endocarditis from pericarditis, it must be remembered that the symptoms arising in its course may cause it to be mistaken for some low fever, and that *physical examination* should be made at frequent intervals in those diseases in which it is liable to occur, so that it may be detected, if present.

PROGNOSIS.—There are always several immediate dangers when endocarditis exists. The remote prognosis will depend on the organic changes remaining behind, and on the orifice which is affected.

TREATMENT.—Nothing can be done directly as regards the endocarditis, and the treatment is mainly that of the disease in the course of which it occurs. In rheumatism alkalies should be given freely, so as to render the blood less irritable. Such measures as bleeding, mercurialization, and application of cold, are decidedly to be deprecated. As a rule stimulants are required in endocarditis, in some cases in large quantity, along with abundant nutriment. Digitalis is indicated if the heart is failing. Should there be signs of obstruction from coagulation, it is recommended to give alkalies and carbonate of ammonia freely, along with alcoholic and other stimulants.

III.—ACUTE MYOCARDITIS.

A brief consideration must suffice for *inflammation of the heart-substance.* It is frequently set up in the layers contiguous to an inflamed endocardium or pericardium. It has been stated to have occurred independently in a few instances, either as a diffuse inflammation or localized, the latter having terminated in abscess. Pyæmia and septicæmia frequently lead to myocarditis, and formation of abscesses.

Myocarditis is attended with discoloration, softening, infiltration with a sero-sanguineous fluid, exudation, or sometimes pus, which may collect in abscesses. It may lead to the formation of cardiac aneurism, or to rupture of the walls of the heart. If recovery takes place, depressed scars may be left.

The *symptoms* and *signs* of this condition are very obscure. It tends to make the cardiac action *extremely weak and irregular,* and when this is a prominent feature in the course of peri- or endocarditis, implication of the heart may be suspected. The *general symptoms* are pyrexia of an adynamic type, with signs of blood-poisoning and collapse.

The only *treatment* affording any hope is *free stimulation.*

CHAPTER XXI.

CHRONIC AFFECTIONS OF THE HEART AND PERICARDIUM.

IN the present chapter it is proposed first to give an account of each of the *ordinary* chronic morbid conditions observed in connection with the heart and pericardium, and at the close to sum up the *diagnosis*, *prognosis*, and *treatment*, under some general observations.

I. Adherent Pericardium.

When, after pericarditis, the surfaces of the membrane become universally agglutinated, and especially if calcareous matter is deposited in the adhesions, or if the outer surface of the pericardium unites with the chest-wall, signs of these conditions may be afforded.

Subjective symptoms are often absent, but there may be uneasy sensations or even a dull pain in the cardiac region, and, in exceptional cases, anginal attacks have been noticed. Disturbed action of the heart, palpitation easily induced, and shortness of breath on exertion, are the chief symptoms complained of, if any. From the effects of the adhesions upon the heart, grave interference with its action and with the circulation may be ultimately induced. An agglutinated pericardium will seriously increase the danger from an attack of any pulmonary inflammation.

Physical signs are only evident when adhesions have formed with the chest-wall, and they are more or less of the following character: 1. *Depression of the præcordial region, with narrowing of the spaces.* 2. *Impulse permanently displaced*, especially *raised*, without there being any obvious cause for this; *unaltered by change of posture or by a deep inspiration;* or having altogether unusual characters, being attended with *recession of the spaces or epigastrium*, or with an *irregular, jogging movement*, both systolic and diastolic. 3. *Dulness* usually *increased*, and *not altered after a deep breath*, there being other signs that the lungs do not expand over the cardiac region. When there is external calcification, the percussion-sound is said occasionally to have an osteal character. 4. Some variety of *friction-sound* may continue.

II. Affections of the Valves and Orifices.

The various conditions which may give rise to *cardiac murmurs* have previously been pointed out, and the characters of the different murmurs described. At present attention will be directed only to those cases in which there is some definite mischief about the valves and their appendages, or orifices of the heart, which interferes with the circulation, either by causing *obstruction* or by permitting *regurgitation.* In the first place it will be well to give a general summary of the pathological modes of origin of these derangements. They may arise from: 1. *Acute endocarditis*, especially, but not solely, in connection with *acute rheumatism.* 2. *Chronic endocarditis* or *valvulitis*, which often appears to be merely a kind of *fibroid degeneration*, the parts affected being very liable to undergo further degenerative changes, in the way of *atheroma* and *calcification.* This is observed, as a rule, in persons advanced in years, especially in gouty subjects, or those suffering from chronic renal disease; it may also occur in younger individuals who are subject to violent physical strain in consequence of which great pressure of blood is thrown upon the aortic valves, as happens in the case of strikers, colliers, gymnasts, boat-racers, &c. 3. *Laceration of a valve* from injury. 4. *Chronic myocarditis*, involving the musculi papillares, which become contracted and indurated, preventing the valves from closing. 5. *Atrophy of the valves*, or, as some suppose, *congenital insufficiency*, rendering them inefficient, or producing so-called "reticulation," or more or less extensive perforations. 6. *Enlargement of the cavities of the heart, involving the orifices*, without proportionate increase in the valves, which are therefore incompetent; or altering the normal relations of the valves and their appendages to the orifices. 7. *Congenital malformations*, which are supposed to result mainly from endocarditis occurring during intra-uterine life. 8. Fibrinous deposits from the blood, or, very rarely, tumors.

It must be mentioned that more than one orifice may be affected from the same cause; and that *disease at one orifice may set up mischief in another*, either by *direct extension*, by *throwing an extra strain upon the valves*, and thus inducing *chronic valvulitis*, or by *enlarging the cavity.*

Special Valvular Diseases.—Having given this general outline, the main facts connected with each orifice will now be considered in order, under the following headings: 1. *Special Etiology.* 2. *Anatomical Characters.* 3. *Clinical Phenomena*, including *signs immediately connected with the lesion*; *direct influence upon the cir-*

culation, and *symptoms resulting therefrom;* and *remote effects upon the heart.*

I. Mitral Regurgitation. Etiology.—1. *Acute endocarditis* is the *ordinary cause* of this condition, the chronic changes which follow it increasing the primary mischief. 2. Cases occasionally are met with in which no history can be obtained of *acute* endocarditis, and the affection seems to be *chronic* and gradual in its progress from the commencement. 3. *Mitral regurgitation* frequently supervenes upon *aortic* disease, being produced in one of the ways already indicated. 4. Very rarely it may result from *mere dilatation of the left cavities*, causing enlargement of the orifice, and displacing the musculi papillares.

Anatomical Characters.—Among the chief morbid conditions observed in different cases are more or less contraction and narrowing of the valves, with irregularity, thickening, and rigidity, there being in some instances scarcely any appearance of a valve; atheroma or calcification; laceration of one of the tongues; adhesion of one or more of them to the inner surface of the ventricle; rupture of chordæ tendineæ; shortening, thickening, induration, or adhesion of these, the smaller ones having often entirely disappeared; contraction and hardening of the musculi papillares; and deposits of fibrin, sometimes in considerable abundance.

Clinical Phenomena.—*Immediate signs.* These are: 1. A *systolic thrill* at the left apex, present in a fair proportion of cases. 2. *Mitral systolic murmur.* 3. Intensification of the *pulmonary artery sound*, which is louder than the aortic.

Influence upon the Circulation.—The *arterial system* will be insufficiently supplied, and also irregularly; hence the pulse is small, weak, and very often *unequal in force and fulness*, not unfrequently also irregular in rhythm. These characters are shown in the *sphygmographic tracing.* Two striking phenomena are sometimes observed in connection with mitral regurgitation, viz., that there is an extremely anæmic appearance; and that, though the heart may be acting violently, and the great arteries in the neck appear to be throbbing, scarcely any pulsation is *felt* in them. Through the "back-working" of mitral regurgitation, the *pulmonary circulation* is necessarily speedily overloaded, the symptoms and ultimate consequences of which have been already described. *Emboli* may also be carried from clots in the right heart, and give rise to *pulmonary infarctions*. In time the *right side of the heart* and *general venous system* become involved, *venous hyperæmia* and its results being produced, often to an extreme degree.

Remote Effects upon the Heart.—The *left auricle* becomes first the seat of dilatation with hypertrophy, and afterwards the *right ventricle*, which is often greatly enlarged, and as a consequence *tricuspid regurgitation* follows. A moderate degree of enlargement of the left ventricle may be produced. *Degeneration* is liable to be set up in time, and the endocardial lining of the left auricle tends to become thickened, opaque, and atheromatous.

II. MITRAL OBSTRUCTION. ETIOLOGY.—This condition is always due to *acute endocarditis* and its consequences.

ANATOMICAL CHARACTERS.—The orifice is more or less in a state of *constriction* or *stenosis*, as well as rough, irregular, and thickened, one or other condition predominating. Occasionally the *valves adhere together*, and a funnel-shaped opening may be thus produced. *Abundant vegetations* on the valves or about the orifice may cause obstruction.

CLINICAL PHENOMENA.—These only differ from those accompanying *regurgitation* in that the *thrill* (which is usually felt) and *murmur* are *præsystolic* or *post-diastolic*. The *pulse* is *regular*, and the *left ventricle* is small and *disposed to atrophy*. The effects on the circulation are similar in both cases.

In not a few instances *mitral regurgitation* and *constriction* exist together. The interference with the circulation and the changes in the cavities of the heart are then necessarily more easily induced. Frequently there are *two distinct murmurs*, but there may be but one. Mitral disease is common in young persons.

III. AORTIC OBSTRUCTION. ETIOLOGY.—1. As a rule *chronic valvulitis*, with *atheroma* and *calcification*, originates *aortic obstruction*, the change being gradual, and hence it is very frequent in old people. It is this valve also which is affected in those who undergo severe muscular strain. 2. Cases are not uncommonly observed, however, in which it can be distinctly traced to *acute endocarditis*.

ANATOMICAL CHARACTERS.—In most cases the *obstruction* is due to the *valves*, which project inwards and become rigid, thickened, irregular, opaque, contracted, atheromatous, or calcareous, so that they cannot be pressed back, but remain constantly in the current of the circulation. Often they are covered with considerable masses of fibrin, and the opening may be almost completely closed. Occasionally *constriction at or about the aortic orifice* is the pathological condition giving rise to obstruction.

CLINICAL PHENOMENA.—*Immediate Signs.* These are: 1. *Systolic thrill* at the *right base*. 2. *Aortic systolic murmur*. 3. If there is no regurgitation the *aortic second sound* is feeble or inaudible, that over the *pulmonary artery* being unaffected.

Influence upon the Circulation.—The *arteries* will be imperfectly filled, hence there is pallor and a tendency to symptoms of cerebral anæmia. The *pulse* is small, regular, and compressible, but is generally modified by hypertrophy or by degeneration, and under the influence of the latter it may become intermittent. A *sphygmographic tracing* shows a difficult and very oblique ascent, a round summit, and the secondary waves absent or slight. *There is no evidence of obstruction to the pulmonary circulation until the mitral orifice has become involved, so as to allow regurgitation.* It is important to notice that particles of fibrin are very liable to be detached from the valves, and give rise to signs of *embolism*, especially in the brain.

Effects on the Heart.—The tendency of *aortic obstruction* is to produce *pure hypertrophy of the left ventricle*, which compensates for the obstruction so long as there is no degeneration. In time *mitral regurgitation* is apt to follow, being set up by extension of disease from the aortic valves, or by the forcible pressure of the blood.

IV. AORTIC REGURGITATION. ETIOLOGY.—1. This is also usually the result of *chronic changes*, and is especially frequent in those who undergo violent strain. 2. Occasionally it follows *acute endocarditis*. 3. There may be a *sudden rupture* or *laceration* of the valve, from extreme pressure thrown upon it. 4. Regurgitation may occur owing to *perforations* in the valve, the result of atrophy or congenital insufficiency. 5. In rare instances the *orifice* is dilated, and the valves cannot close it; degeneration at the root of the aorta may also lead to their imperfect adaptation, and thus give rise to regurgitation.

ANATOMICAL CHARACTERS.—The ordinary state of the valves has already been described under *aortic obstruction*, and they are often so shrunken, deformed, and rigid as to permit regurgitation, as well as cause obstruction. Sometimes they adhere to the walls of the vessel; or a tongue is seen lacerated, or having a considerable perforation in it.

CLINICAL PHENOMENA.—It will be sufficient to point out the important characters which distinguish *regurgitation* from obstruction. *Very rarely* is there any *thrill*, but possibly a *diastolic thrill* may be felt, and a loud *diastolic murmur* is generally present. The *pulse* is quite characteristic, owing to the blood being forced into the vessels under unusual pressure, causing their excessive distension, which rapidly subsides, however, on account of the regurgitation. This can be observed in all the arteries, and has even been seen in the eye by the aid of the ophthalmoscope. They are visible, tortuous, elongated and movable with each systole of the heart, the pulse being jerking, abrupt, and hard, succeeded by a rapid subsidence or "fall-back;" the sensation has been well described as resembling "balls of blood shot under the finger." There is no irregularity so long as the heart tissue is healthy. The important character of the *sphygmographic tracing* is, that *the line of descent falls suddenly, and the aortic wave is more or less indistinct, or absolutely wanting.* By observing this *the degree of regurgitation* may be determined. The *line of ascent* is usually long and vertical, with a sharp summit, but it may be square or convex, if *obstruction* also exists. The *distension-wave* is raised, and the notch preceding it exaggerated, while unusual *vibratory-waves* are not uncommon. A loud murmur is often heard in the arteries. In course of time they are very prone to become the seat of atheromatous degeneration, owing to the repeated strain upon them.

The principal morbid change produced in connection with the heart is *hypertrophy with dilatation of the left ventricle*, which tends to become extreme. This is at first usually in excess of what is required for compensation, and it is to this that the great distension of the arteries is due, while it also gives rise to symptoms indicative of arterial and capillary plethora. *Degeneration of the* *hypertrophied heart* is liable to occur soon for the following reasons. The supply of blood to its walls through the coronary arteries is interfered with, because this depends upon the *aortic recoil,* which is, however, rendered inefficient owing to the *incompetency of the valves allowing the blood to return into the heart;* while at the same time the aorta and other large vessels become atheromatous, and therefore deficient in elasticity. The *mitral orifice* is also liable to be involved, as in the case of *obstruction,* and serious symptoms will necessarily follow this event and the cardiac degeneration, the latter setting in in some cases with great rapidity.

V. TRICUSPID REGURGITATION. ETIOLOGY.—Practically this is either associated with *dilatation of the right cavities,* consequent upon *some obstruction in the lungs,* especially from *emphysema;* or it follows *mitral disease,* being then partly due to *disease of the valves,* from extra pressure.

ANATOMICAL CHARACTERS.—The orifice may be simply dilated, the valves being thus rendered incompetent, but being free from disease; or the valves, especially the fixed tongue, with the chordæ tendineæ, are occasionally contracted and deformed. I have now and then observed much fibrinous deposit on them, when there was scarcely any organic mischief.

CLINICAL PHENOMENA.—*Immediate Signs.* 1. It is stated that a *systolic thrill* has been felt in the epigastrium, but this must be extremely exceptional. 2. The characteristic *systolic murmur* is more frequently absent than present, and requires usually an experienced auscultator to detect it. In exceptional instances, however, it is well marked.

Influence upon the Circulation.—The general venous system suffers speedily and severely from *tricuspid regurgitation,* and all the symptoms resulting therefrom follow, this condition being a great cause of *cardiac dropsy.* The abdominal circulation is affected very early, on account of the deficiency of valves here. In addition, some important *physical signs* are originated, viz., *distension and varicosity of the cervical veins,* especially the *right external jugular,* and sometimes of the veins over the chest; *venous pulsation in the neck,* and some believe also in the *hepatic veins;* and *filling of the jugular vein from below, after it has been emptied by pressure.* The *pulmonary circulation is relieved*, and thus pulmonary symptoms are often diminished.

Effects on the Heart.—Tricuspid regurgitation tends to increase hypertrophy of the *right ventricle*, and to produce enlargement of the auricle. If considerable, it may diminish murmurs on the left side of the heart.

VI. Tricuspid Obstruction is a mere curiosity, if it ever exists. It might possibly be produced by endocarditis during intra-uterine life, and its signs and effects would be similar to those of regurgitation, except that the murmur would be *præsystolic*.

VII. Pulmonary Disease.—A very few observations will suffice for the affections of the pulmonary orifice. They are extremely rare, especially regurgitation. In the great majority of cases *obstruction* is due to *congenital constriction* of the orifice, which may be extreme; sometimes the valves are much thickened, atheromatous and calcareous. A *systolic thrill* and *murmur* may be observed at the *left base*. The pulse is *not affected*, as it is in aortic disease; and there is evidence of *right hypertrophy* and *dilatation*, followed by overloading of the *systemic veins*.

General Remarks on Local Symptoms in Valvular Diseases.—It is impossible to lay down any definite statement with regard to these. *Uneasiness or pain* may be present, but are often absent; they are most frequent in connection with aortic disease. *Palpitation* and *dyspnœa* are common symptoms, and they render the patient incapable of exertion.

III. Enlargements of the Heart.

The heart may be enlarged in two ways: 1st, by *hypertrophy of its muscular walls;* 2d, by *dilatation of its cavities*. In most instances there is a combination of these conditions, though in very variable degrees, and the varieties met with are sufficiently indicated in the following classification:

1. *Simple hypertrophy.* 2. *Eccentric hypertrophy*, or *hypertrophy with dilatation*, the former being in excess. 3. *Dilatation with hypertrophy*, the dilatation being the more marked. 4. *Dilatation with attenuation of the walls* or *simple dilatation.* A form has been described as *concentric hypertrophy*, in which the cavities are

diminished, but in reality this appearance is merely due to post-mortem contraction of the walls of an hypertrophied heart.

It will be convenient to consider hypertrophy and dilatation together, any special facts relating to either being indicated as occasion arises.

Etiology.—The numerous causes of cardiac enlargement may be ranged under certain heads.

1. *Direct obstruction, either in connection with the orifices of the heart or with the vessels, which interferes with the passage of the blood.*—*Cardiac obstructions* are usually seated at the *aortic* or *mitral* orifices, very rarely at the *pulmonary*. The *aorta* may be obstructed by extensive atheroma or calcification, aneurism, congenital constriction, or external pressure of an aneurism or other tumor. In connection with the *general circulation*, the conditions giving rise to enlargement are extensive atheroma and calcification of the arteries; changes in the arterioles and capillaries, accompanying chronic renal disease; and alterations of calibre of the small vessels, associated with exophthalmic goitre. In the pulmonary circulation obstruction may arise from congenital constriction, or external pressure upon the pulmonary artery; chronic pulmonary diseases, epecially chronic bronchitis with emphysema, compression by pleuritic adhesions with retracted side, and interstitial pneumonia; or atheroma of the pulmonary vessels.

Obstruction tends more especially to produce *hypertrophy*, but if it is brought about suddenly, a *primary dilatation* ensues; when gradual in its progress, the hypertrophy is often of the most pure type.

2. *Distension of the walls of the heart during diastole, under increased pressure.*—This is a most important cause of cardiac enlargement, being chiefly exemplified by *aortic* and *mitral regurgitation*, and, to a less degree, by *tricuspid regurgitation*. In these conditions there are *two currents of blood* entering the cavity into which regurgitation takes place, often under excessive pressure. At first *dilatation* is produced, but, in most cases, *hypertrophy* is soon superadded, the relative proportions depending upon various circumstances, and the heart may ultimately assume enormous dimensions.

3. *Constrained action of the heart, when the contraction of this*

organ is impeded, and it has to work under physical disadvantages.—*Displacement* of the heart from any cause, but especially pleuritic effusion; interference with its action from *deformed thorax;* and *pericardial agglutinations* are the important causes of enlargement coming under this head, and they tend chiefly to produce hypertrophy.

4. Some are of opinion that mere *excessive cardiac action,* such as is observed in connection with habitual palpitation, will induce hypertrophy; but others would explain this by affirming that there is an obstacle in the arterial circulation, owing to contraction of the muscular coat, which leads to compensatory hypertrophy.

5. It is believed that *permanent enlargement* may follow the dilatation which frequently results from some temporary loss of resisting power in the walls of the heart, such as is associated with softening in low fevers, myocarditis accompanying peri- or endocarditis, or nervous debility due to excessive smoking or venery, and various other causes. After recovery, a compensatory hypertrophy is said to be set up, and Fothergill is inclined to believe that this may lead to a reduction of the ventricular cavity to its original and normal dimensions.

6. I have deemed it best to notice separately that important class of cases, in which cardiac enlargement is the result of *violent effort, especially with the arms,* such as is carried on in certain laborious occupations (hammermen, colliers, &c.), gymnastic exercises, rowing, climbing mountains, &c. This is principally due *to the obstruction to the circulation* which is produced by the *muscles crossing the arteries,* the former also by their rigid condition opposing the passage of blood through the vessels within them; and, after a time, to the aortic disease which is originated. The *excessive action* of the heart which is excited from time to time, must not, however, be overlooked as probably aiding in causing the enlargement, and some lay much stress upon this. Enlargement of the *right cavities* is very liable to be produced in runners, swimmers, divers, and others who tax their wind unduly from time to time.

7. *A plethoric state of the system* resulting from overeating, es-

pecially of nitrogenized food, and abuse of alcohol, has been stated to cause hypertrophy.

8. Cases of hypertrophied heart now and then come under observation, in which *no cause* can be detected, and then the hypertrophy is presumed to be *idiopathic* and *primary*.

With regard to *dilatation* it is only necessary to mention further, that it is more liable to be produced and more marked in those conditions which give rise to *great internal pressure on the walls during diastole;* when obstruction arises *rapidly;* and *when the walls of the heart are deficient in resisting power* from any cause, as after acute or long-continued chronic illness, congestion or serous infiltration of the tissues, myocarditis, and various degenerative changes, especially *fatty* and fibroid.

Before proceeding to the consideration of the *morbid appearances* and *clinical phenomena* associated with cardiac enlargements it is needful to remark that there are some important circumstances which influence them, viz.: 1. The nature of the enlargement, whether due to hypertrophy, dilatation, or both, and the relative degrees in which these are combined. 2. The part of the heart affected. 3. The state of the cardiac walls. 4. The condition of the valves and orifices. 5. The presence of pericardial adhesions.

ANATOMICAL CHARACTERS.—The important alterations produced in the heart from hypertrophy and dilatation, may be stated as follows: 1. *Increase in bulk*, this being more marked in proportion to the *dilatation.* 2. *Increase in weight*, which is due to *hypertrophy*, and therefore in the ratio of this. The enlargement and excess in weight vary greatly, the heart being sometimes three or four times heavier than the normal, and enormously increased in dimensions. It is then called the *cor bovinum vel taurinum.* 3. *Change in shape.* In *general dilated hypertrophy*, the heart tends to become more or less globular, the apex being rounded or obliterated. If the *left cavities* are alone involved, and especially merely hypertrophied, the heart is elongated and more conical, the apex of the left ventricle extending downwards some distance beyond the right. When the *right side* is affected alone, there is a tendency to roundness and increase in breadth, the right ventricle lying forwards, so as to overlap the left, and to form the apex. 4. *Alteration in position and axis.* As a rule there is a proneness to a lowering of the heart, and displacement of the apex to the left, while the right border becomes more horizontal, the last character being especially observed in right-side enlargement, which may also cause increase in an upward direction. 5. *Changes in the thickness of the walls and in the size and shape of the cavities.* There are generally obvious alterations in these respects, but they vary considerably, according to both the absolute and relative degree of hypertrophy and dilatation. The walls of the left ventricle may be 1½ to 2 inches in thickness; those of the right from 1 to 1½ inch. The septum is usually involved also, and tends to bulge towards that cavity which is least implicated. It must be remembered that there may be considerable hypertrophy without any thickening of the walls, because it is accompanied with much dilatation. In simple dilatation the walls of an auricle may become so thin as to consist of scarcely anything but pericardium and endocardium, and to be almost transparent. 6. *Physical characters of the heart-tissue.* In hypertrophy, provided no degeneration has set in, the cardiac walls appear either of normal color, or of an unusually bright-red tint, and, as it were, more healthy and robust than normal, while the tissue feels very firm and resistant. Fatty degeneration may, however, occur, and this will give rise to various tints, as well as to diminution in consistence. In proportion to the dilatation, the heart generally feels soft and flabby. 7. *Structural changes.* It must be borne in mind that, in the hypertrophy now under consideration, the increase is in the muscular tissue. It has been held that the previously existing fibres become enlarged and lengthened; but it is far more probable that there is a new formation, the fibres being increased in number, and arranged more closely together. Fatty degeneration frequently occurs, and it has been supposed that the recently-formed fibres are more liable to this change. The coronary vessels become enlarged, and some believe that the nerves and nerve-ganglia are also increased in size; others think that there is only a hyperplasia of the connective tissue associated with these. The valves may become hypertrophied in the same ratio as the muscular tissue.

With regard to the part of the heart affected, this will depend on the cause of the morbid changes, and the enlargement may be general; limited to the left, or, less commonly, to the right side; to one cavity, especially a ventricle, or even to particular portions of this. As a general statement, it may be said that the left side of the heart is more liable to hypertrophy, the right to dilatation. The auricles are probably never solely hypertrophied, being always dilated as well.

SYMPTOMS.—It is difficult, for many reasons, to indicate precisely what symptoms are directly due to hypertrophy and dilatation, and on this part of the subject it must suffice to state the main general facts.

1. *Pure hypertrophy*, provided it is strictly compensatory, and no more, may be unattended with any symptoms whatever.

2. In many cases, however, it tends to be excessive, and thus gives rise to sensations of the increased action, both in the heart and in the arteries; as well as to signs of active congestion of the systemic circulation, especially that of the brain, or of the pulmonary circulation, or both, according as the hypertrophy is left, right, or general, these being increased by anything which excites the heart, such as a little exertion. The violent distension of the arteries produced by excessive hypertrophy, ultimately leads to their degeneration, and it certainly may cause rupture of the cerebral vessels, and consequent apoplexy. It is believed that the pulmonary vessels may undergo degeneration from the same cause, and that they may give way also.

3. If the hypertrophy is insufficient, or is associated with dilatation or degeneration, then there are more marked symptoms. In the first condition there is palpitation, with dyspnœa, especially after any exertion, and now and then irregularity or intermittency. Degeneration is indicated by feebleness of circulation and a tendency to syncope. Dilatation will be considered in a separate paragraph.

4. In proportion to the amount of dilatation will the functions of the heart be disturbed, so that it becomes more and more difficult to carry on the circulation, which is retarded and rendered languid, and thus the mass of the blood is insufficiently aerated, while the capillaries and veins are overloaded and the arteries imperfectly filled. Most uncomfortable sensations are often ex-

perienced over the cardiac region, which may amount to intense anginal pains. Palpitation, irregularity, and intermittency are either constantly present or brought on by slight causes, especially after any effort, or as the result of flatulence from indigestion. Dyspnœa is also persistent to a greater or less degree, easily increased, and often amounting to orthopnœa—while all the other consequences of pulmonary congestion are very liable to arise. The symptoms due to *general venous congestion* are present to their fullest extent, when there is much dilatation of the right cavities. It is important to notice, that while in hypertrophy the urine is unaltered, in proportion to the dilatation it becomes more scanty and concentrated, and usually contains albumen, which may amount to one-eighth or one-sixth its bulk.

PHYSICAL SIGNS.—In describing these, an endeavor will be made to indicate the chief variations which may be met with.

1. *Bulging* over the cardiac region is observed, in proportion to the *hypertrophy*, to its duration, and to the youth of the patient, its seat and extent also depending upon those of the hypertrophy. The spaces may be widened, but are not protruded. Dilatation does not cause bulging.

2. The *impulse* is much altered. In *hypertrophy* it is usually displaced down and to the left, sometimes reaching to the seventh or eighth space, and three inches or more to the left of the nipple; somewhat increased in area, but well-defined and limited; forcible, in some instances to an extreme degree; slow, impulsive, and heaving or pushing in a downward direction (which is best realized through the stethoscope), and regular. *Dilatation* tends to widen the impulse transversely, especially towards the right, but does not lower it; it becomes extensive, diffused, and ill-defined; liable to change its place with different beats of the heart; more or less feeble, being sometimes seen when not felt, or neither perceptible to touch nor sight; of jerking or slapping quality, or occasionally almost undulatory; unequal in force and irregular in rhythm, or even intermittent; sometimes double, or with a diastolic impulse. It will be readily understood that according to the degree in which hypertrophy and dilatation are combined will the impulse partake of the characters of one or the other. Further, the part of the heart involved will influence it. When the right side is

affected, the impulse is behind and to the right of the sternum and ensiform cartilage, or in the epigastrium, and appears superficial. Hypertrophy about the base of the heart may originate an impulse there, and if either auricle is enlarged, auricular pulsation may be produced over the corresponding region. Valvular diseases and fatty degeneration frequently affect the impulse in enlarged heart.

3. *Cardiac Dulness.*—In all forms of enlargement this necessarily is increased, but it is important to notice in *what directions* the increase takes place, and the *shape* of the dulness. *Hypertrophy* generally enlarges it downwards and to the left, and causes it to assume a vertically-elongated form. *Dilatation* augments it transversely, especially towards the right, making it square or circular, but does not lower it. *General hypertrophy with dilatation* gives rise to the greatest enlargement, both laterally and downwards, the shape being more or less square. It is said that the dulness of hypertrophy is *more marked* than that of dilatation, and that the *sense of resistance* is greater; but these characters are by no means reliable. Enlargement of one or other side of the heart will cause the dulness to increase in a corresponding direction, and localized enlargement will give rise to localized dulness.

4. *Cardiac Sounds.*—In *hypertrophy* the *first sound at the apex* is obscure, muffled, low-pitched, and somewhat prolonged, the *muscular element* being in excess. In some cases there can scarcely be said to be a real sound, but rather a sensation conveyed to the head through the stethoscope, and occasionally a sound as of knocking against the chest-walls is heard. At the base the first sound may be much clearer and more valvular. The second sound is often well accentuated at the base, so as to resemble a first sound. In *dilatation* the sounds tend to be feeble, but clear, short, sharp, and valvular. The first sound becomes weaker towards the base, but the second may be well accentuated there. A peculiar sensation is described in simple dilatation, communicated through the stethoscope, as of a diffused tumble of the heart against the chest-wall, with rolling over, followed by a pause, compared to "the sudden halt of strikers on an anvil" (Richardson); or "to a horse changing its feet while cantering" (Fothergill). Combined *hypertrophy and dilatation* cause the first sound to become extremely loud, full, prolonged, and accentuated,

so as to be heard very extensively; if the valves are also hypertrophied, it may have a clanging quality. The sounds will be unusually to the right or left, if either side is particularly affected, and right hypertrophy is attended with increased accentuation of the pulmonary second sound. Reduplication of the sounds is common in enlargement of the heart.

5. *Murmurs* are occasionally produced from enlargement of cavities, as already explained. Hypertrophy with dilatation will intensify murmurs due to valvular diseases, and the latter will necessarily modify the sounds already described.

6. An enlarged heart will cause *displacement of neighboring structures.* The lungs, especially the left, may be pressed upon, dulness and feeble respiration at the base being thus originated. The diaphragm, liver, and stomach may be also depressed.

7. *Pulse.* In *hypertrophy,* involving the left ventricle, the larger arteries are generally seen to throb more or less violently, and sometimes the smaller ones also. The *pulse* is disposed to be less frequent, slow and prolonged, full, tense, powerful, heaving, incompressible, and regular, having the characters known as constituting the "hammering" pulse. A *sphygmographic curve* shows a more or less square summit. In proportion to the *dilatation,* the pulse tends to become more feeble, small, compressible, lagging, and irregular or intermittent. When the right side is alone involved, the radial pulse is not influenced, or only to a less degree, and this may be of assistance in diagnosis.

IV. ATROPHY OF THE HEART.

ETIOLOGY.—Atrophy of the heart may be met with under the following circumstances: 1. As a *congenital* condition, especially in females. 2. In connection with *general wasting* from old age, starvation, low fevers, phthisis, cancer, and other affections inducing marasmus. 3. From *pressure upon the heart,* by pericardial agglutinations or effusion, or excessive accumulation of fat. This cause acts partly by interfering with the supply of blood. 4. As the result of *disease or obstruction of the coronary arteries,* the heart being therefore imperfectly nourished, and the atrophy is then generally accompanied with degenerative changes.

Anatomical Characters.—Diminution in weight is the characteristic feature of cardiac atrophy, and this may be reduced to 3¼ ozs., or even less. As a rule the heart is also small, and its cavities contracted, being of normal shape. An *eccentric* form is described, however, in which there is dilatation as well as atrophy. The muscular tissue is usually wanting in tone, and fatty degeneration is not uncommon.

Symptoms.—Feebleness of the circulation is the only symptom which can be attributed directly to atrophy. When it is due to pressure on the heart, or interference with its supply of blood, severe symptoms are often present, such as palpitation, dyspnœa, and general venous congestion; but these are not the immediate results of the atrophy. The *physical signs* are: 1. A feeble *impulse*, which may be raised. 2. Diminished area of *dulness*. 3. Weak or sometimes almost extinct *sounds*. 4. *Pulse* small, feeble, but regular.

V. Fatty Disease of the Heart.

There are two distinct pathological processes in connection with the heart to which the term "fatty disease" is applied, each requiring separate consideration.

1. Fatty Infiltration.

Etiology.—This condition is observed: 1. As a part of *general obesity*, especially in elderly persons. 2. In individuals who have suffered from *cancer*, *phthisis*, and other wasting affections. 3. In connection with *chronic alcoholism*.

Anatomical Characters.—There is an infiltration of the connective-tissue cells about and in the substance of the heart with fat, leading to a kind of "fatty hypertrophy." This commences under the pericardium, but it penetrates inwards between the muscular fibres, causing their degeneration and absorption, so that finally the walls may be almost or entirely composed of fat in the parts involved. The ventricles are chiefly affected, especially the right, and there is a particular tendency to the accumulation of fat along the sulci, and about the base and apex. The tissue is necessarily pale, soft, flabby, and lacerable.

SYMPTOMS.—Fatty infiltration may be suspected, but cannot often be positively made out. If considerable in amount, it is liable to be accompanied with uncomfortable sensations in the cardiac region, palpitation on exertion, shortness of breath, a weak and languid circulation, leading to incapacity for any effort, chilliness of the extremities, tendency to giddiness or faintness, &c. *Physical examination* only reveals a feeble *impulse* and *sounds*, and a weak, compressible *pulse*. Often, however, there is so much fat over the chest, as to render the local signs mentioned unreliable.

2. FATTY DEGENERATION OR METAMORPHOSIS.

ETIOLOGY.—The pathological modes of origin of fatty degeneration of the cardiac walls are as follows: 1. In the large majority of cases it results from *malnutrition*, owing to *some interference with the supply of blood through the coronary arteries.* This may arise from atheroma or calcification of the vessels themselves; embolic obstruction; external compression, especially by pericardial thickenings; or impairment of the force of the aortic recoil from any cause. An hypertrophied or dilated heart is very liable to degenerate, chiefly in consequence of inadequate blood-supply. 2. This disease is sometimes a part of a *general tendency to fatty changes*, these being observed as well in the kidneys, lungs, vessels, cells of the cornea, &c. They may be set up without any evident cause, or in connection with senile decay, alcoholism, gout, and lowering diseases, such as phthisis or cancer. Most authorities regard them as being the result of some *unhealthy condition of the blood,* but it has been suggested that the trophic nerves are at fault. Some are of opinion that the heart and other structures may become fatty *in consequence of renal disease*, which renders the blood impure. 3. More or less fatty *degeneration* is associated with *infiltration*, and it may follow myocarditis. 4. It has been found in connection with poisoning by phosphorus, phosphoric and several other acids. 5. It has been suggested that *disease of the cardiac ganglia and nerves* may lead to fatty degeneration.

Predisposing Causes.—The most important of these are *age*, the disease being very uncommon in the young, and increasing in frequency after middle life to about the sixty-third year (Watson), after which it gradually becomes less common: the *male* sex; sedentary and indolent habits, especially when combined with overeating and drinking, and hence it is said to be more common among the higher classes and in those whose occupations lead to the above habits, such as publicans, butlers, &c.; and the presence of gout or Bright's disease. Neither general obesity nor the opposite condition seems to have any influence.

ANATOMICAL CHARACTERS.—Fatty metamorphosis may be observed in a heart of normal size, or in one enlarged or atrophied. The *ventricles* are by far most frequently affected, especially the *left*, and the change may be seen over a considerable extent, or be limited to certain parts, if due to localized obstruction. It may commence primarily at either surface or deep in the walls.

The alterations in *physical characters* are marked if the degeneration is advanced. The *color* is paler and dull, either brownish-red, pale-brown, or presenting various "faded-leaf" tints, being sometimes actually yellow. These colors may be seen throughout, or merely in streaks. The *consistence* is diminished, the tissue tearing and breaking down under pressure readily, and the cardiac walls occasionally resemble mere "wet brown paper." There may be a greasy feel, oil being yielded on pressure, or to the knife, blotting-paper, or ether.

The *microscopic* changes are characteristic, and may be observed before there are any alterations evident to the naked eye. At first the striæ of the muscular fibres are merely rendered indistinct by fat-granules and oil-globules, being brought out again by ether. Gradually they become more and more obscured, until finally they disappear altogether, the fibres being made up entirely of fat. Some are of opinion that fat is found between as well as within the fibres.

SYMPTOMS.—Undoubtedly fatty degeneration may exist without there being any clinical evidences of this condition, or only such as are doubtful. Sudden death has occurred from this cause, when there had been no previous suspicion of anything being wrong. Cases, however, do occur not uncommonly, in which the diagnosis may be made with tolerable positiveness. As a rule, the progress of the disease is very gradual and insidious. Most of the symptoms are due to the feeble action of the heart.

Unpleasant sensations are frequently complained of over the cardiac region, and anginal attacks are very liable to occur. *Palpitation* is often felt during the progress of the degeneration, not, however, directly due to the diseased fibres, but to those which are unaffected, these being insufficient for carrying on the circulation. The principal disturbances of the cardiac action observed are *infrequency*, the beats being reduced to fifty, forty, thirty, twenty-five, or even less, in a minute; *feebleness; irregularity;* and *intermittency.* Any exertion tends to increase the frequency, and *to make the action very irregular.*

The appearance of the patient may afford signs of the disease. There is not unfrequently a sallow, earthy tint, combined with anæmia, or with lividity about the lips, and enlarged capillaries on the cheeks, both of which appearances I have seen well marked. Fothergill describes the skin as sometimes resembling discolored parchment, having a greasy feel, and presenting changes in the epidermis. The tissues are generally flabby and wanting in tone. There are frequently evidences of degeneration, which may be premature, in the vessels and other structures. Among these the *arcus senilis* has been considered of material diagnostic importance, especially when it is yellow, ill-defined, and passes into a cloudy cornea.

The patient feels weak and languid, deficient in vitality, subject to chilliness, and incapacitated for any exertion, which brings on shortness of breath, faintness, or actual syncope. Involuntary sighing is sometimes observed, and also the disturbance of breathing already described as *Cheyne's symptom.*

Owing to the inadequate supply of blood to the nervous centres, important symptoms arise. The chief of these are habitual depression of spirits, irritability and moroseness, curious sensations in the head, disturbances of vision, febleness of intellect, with failure of memory and inaptitude for thought, tremulousness and an unsteady gait, with a tendency to sudden attacks of giddiness, which make the patient cling to the nearest object, restless and disturbed sleep attended with startings, unusual sensations in the limbs, &c. *Sudden cerebral anæmia* is very liable to occur, inducing *syncope*, *apoplectiform*, or *epileptiform* attacks, or a combination of these conditions, which, however, are soon recovered from as a rule, and do not leave any permanent ill effects behind.

The *digestive organs* are generally out of order. A sensation of sinking in the epigastrium is often complained of. Sexual inclination and power are notably deficient.

It must be borne in mind that fatty degeneration may set in in connection with a hypertrophied or dilated heart, or with valvular disease, and will then modify the symptoms as well as the physical signs due to these conditions, adding to the difficulty of carrying on the circulation.

PHYSICAL SIGNS.—The only positive signs of fatty heart are these: 1. The *impulse* is feeble or absent, but if perceptible, it is well defined. 2. The *sounds* are weak, especially the first, and this may be almost inaudible, especially at the base, where it is weaker than at the apex. The second sound may be fairly accentuated. 3. The *pulse* is very feeble, small, and compressible, often *infrequent*, and there may be but *one pulsation* to *two ventricular contractions*; it tends to be very irregular, and may become hurried paroxysmally, so as to be almost uncountable from its frequency and irregularity (Walshe).

COURSE AND MODES OF TERMINATION.—Patients suffering from fatty heart may go on for years, but death is to be feared at any moment if the disease is advanced. The fatal termination may occur quite suddenly from syncope, usually after some effort, rupture of the heart, either sudden or gradual, or as the result of the cerebral attacks; or gradually from asthenia, which may be attended with dropsy, but this symptom is often absent in extreme cases from first to last, and it is a question whether fatty disease alone can give rise to it.

GENERAL DIAGNOSIS OF CHRONIC CARDIAC AFFECTIONS.

The chief questions to be decided in making a diagnosis with regard to the heart may be thus summarized: 1. It is necessary to determine whether there is any real organic mischief, or merely functional disturbance, should there be any symptoms affecting this organ. 2. If the former, its nature, exact seat, and amount must be made out, the main conditions to be borne in mind being different valvular diseases, alteration in the size or capacity of the heart, changes in its walls, interference with its supply of blood, and pericardial effusion or adhesion. It must be remembered that these are often presented in various combinations, and an endeavor should be made to determine the exact state of the structures in every particular mentioned. 3. If possible the pathological cause of any lesion present should be ascertained. An account of the diagnosis of each disease would involve unnecessary repetition, and here it is only intended to indicate the data on which this should be founded, and these are: 1. The *previous history* of the patient, special inquiry being made with regard to *acute rheumatism*, and *violent exertion*. It may be of some help to note whether there is any family predisposition to cardiac disease. 2. The age, sex, and general condition, particularly observing whether there are signs of degeneration. 3. The *symptoms* present, especially noting if the *circulation is disturbed in any way*, and the effects thus produced. 4. The *physical signs*. Physical examination is the only positively reliable means of diagnosis, and daily experience enforces the importance of thoroughly investigating the state of the heart in any case which comes under observation for the first time, and especially when examining for life insurance. The points to be attended to are, whether there is any change in shape or size over the cardiac region; the characters of the impulse in every particular; the position, form, and extent of the cardiac dulness; the characters of the sounds, these being compared also over different parts; and if there is any pericardial or endocardial murmur. It is also requisite to examine carefully the *arteries* and *veins*, making use of the sphygmograph in connection with the former, and observing whether there are evidences of degeneration in them.

It it necessary to draw attention to the following facts: 1. The heart may be displaced by conditions external to it, thus giving rise to abnormal physical signs, when it is not itself affected; while signs of organic disease may be modified by the state of contiguous structures. 2. Murmurs may be present independently of organic disease, or merely from roughness of the endocardium, which is unattended with any danger. 3. The bulging or dulness associated with pericardial effusion or cardiac enlargement may be simulated by excessive temporary distension of the right cavities of the heart; aneurism of the aorta; tumor, abscess, or accumulation of fat in the mediastinum; localized pleuritic effusion; consolidation or retraction of the anterior edges of the lungs, especially of the left. 4. Positive organic disease may exist without there being any distinctive signs, particularly degeneration in its less advanced stages. 5. Severe symptoms in connection with the heart may be complained of, and there may even be marked objective disturbance of the cardiac action, amounting to irregularity or intermittency, from mere functional disorder. Much stress has been laid on certain points in making out whether local symptoms are due to organic mischief or not, viz., that mere functional disturbance is not increased by effort, is inconstant, and usually brought on by some obvious exciting cause. My own experience would lead me to avoid putting any very implicit reliance on these distinctions, except that grave disorder following slight exertion may be a useful sign as indicating degeneration.

GENERAL PROGNOSIS.

Any organic affection of the heart should be regarded as serious, but numerous circumstances affect the prognosis, and every case has to be considered in several aspects before a satisfactory opinion on this matter can be given. It must be premised that great care should be exercised against mistaking mere functional disorder for organic disease, and *vice versâ*, which might involve a wrong prognosis in either direction, and it is therefore highly improper to attempt to found any opinion on mere subjective symptoms.

The questions which have to be considered in any particular case are mainly these: 1. Whether there is any danger of *sudden death*. 2. What are the events likely to arise in the progress of the case, and the dangers to be feared. 3. The probable duration. 4. Whether a cure is possible. In the following remarks an endeavor will be made to indicate the chief matters to be attended to in order to arrive at a conclusion on these questions, and to state the principal facts which experience has established.

1. The prognosis must necessarily be guided by the *nature*, *seat*, and *extent* of the disease, and whether there is more than one form present, the knowledge of this being of course founded on a satisfactory physical examination. Instances are met with occasionally in which there is mere roughness of the endocardium, which is attended with a murmur. In such cases there is not much danger, except that the mischief might spread to the orifices and valves or their appendages. Any organic affection in connection with either orifice, inducing obstruction or regurgitation, is decidedly serious, but the dangers are very different at the different orifices, and depend upon their precise condition. In estimating the probable evils, it must be borne in mind in what way the various lesions influence the circulation, and the secondary changes which they are likely to produce in the heart, as upon these points the prognosis will mainly rest. With regard to *sudden death*, *aortic regurgitation* is the only form of *valvular disease* in which this event is at all frequent, but it has been stated to occur in *mitral regurgitation* occasionally. *Obstructive* disease on the left side is only injurious by its "back-working," and its effects on the heart and circulation. *Aortic obstruction* often lasts a long time without producing any particular evils, and cases of *mitral constriction* also go on for a considerable period frequently. *Mitral disease* is chiefly dangerous from its effect on the lungs. *Tricuspid regurgitation* is one of the most serious affections of the orifices, on account of the distressing symptoms by which it is certain to be followed in time, and often very speedily, through overloading of the venous circulation, but its course is frequently tedious, the patient leading a miserable existence. *Pulmonary constriction* acts in the same way. It will readily be understood that extensive or double disease at an orifice increases the gravity of the prognosis. As a rule also it is worse when two or more orifices are involved, but implication of an opening secondarily sometimes gives temporary relief, as in the case of tricuspid regurgitation following mitral disease, which diminishes the severity of the pulmonary symptoms.

With regard to the question whether valvular disease is ever curable, I certainly have met with cases in which marked *mitral constrictive murmur* has disappeared completely in *young persons*, and though entire restoration to the normal condition is probably not possible, it is not unlikely that inflammatory deposits, leading to both aortic and mitral obstruction, may be partly absorbed in course of time.

Hypertrophy in the majority of cases is decidedly a preservative or compensatory lesion, and consequently cannot be looked upon as of evil import. It is only dangerous when excessive, as then it may lead to rupture of vessels, especially if these are diseased, a condition which it tends itself to produce, through constant overdistension; when on the right side, it is further injurious through keeping up a constant state of active congestion of the lungs. Some are of opinion that hypertrophy may subside, if the cause which has induced it can be removed.

Dilatation is a *very dangerous condition*, and in proportion to its degree, and to its excess over hypertrophy, the prognosis becomes worse. *Sudden death* may occur in connection with a weak, flabby, greatly dilated heart, and it materially augments the difficulties in carrying on the circulation, thus contributing to the production of dropsy and other serious symptoms.

Degeneration of the heart's walls, especially *fatty disease*, is another very grave lesion. It is when this sets in that the prognosis becomes so much worse in compensatory hypertrophy. *Extensive fatty degeneration* is one of the most frequent causes of *sudden death* from cardiac disease.

Pericardial agglutinations add much to the evils of other lesions, and tend to produce changes in the heart itself. I have observed some cases in which this condition seemed to have considerable influence in bringing about a fatal result in pneumonia.

In many cases these affections are variously combined, and the prognosis has then to be gathered from a careful determination of the exact lesions present.

2. The *symptoms* present will affect the prognosis considerably. Severe anginal attacks, great irregularity or intermittency of the cardiac action, a tendency to syncope or to apoplectiform or epileptiform seizures, increase the danger of a case very materially. When the general venous circulation becomes much interfered with, and dropsy sets in, the duration is not likely to be very prolonged, but it is impossible to make any definite statement on

this matter, as patients often linger on for some time, and may even improve considerably under appropriate treatment. It is important to notice further, that acute pulmonary complications may arise and produce very severe symptoms, also increasing the dropsy considerably, so that the case appears to be approaching a speedy termination; but, on the subsidence of these, great improvement may take place, and the patient again goes on for some time, and may even feel better than before.

3. The *cause* of the disease may influence the prognosis, as well as whether this is capable of being removed. For instance, as regards improvement in valvular disease, it is only when this results from acute inflammation that any such hope can be entertained. If induced by chronic and degenerative changes, matters always tend to become worse. As has been previously stated, some regard a certain degree of hypertrophy, or even dilatation, as capable of being completely cured, if the cause can be removed.

4. The *state of other organs and structures*, especially the *lungs*, *kidneys*, and *arteries*, should modify considerably the opinion in any given case, and hence their condition ought to be carefully investigated. If the vessels are much diseased, the structure of the heart is very likely to undergo degeneration speedily.

5. Among general matters affecting the prognosis, are the age of the patient; the family history as indicating a tendency to death from heart-disease at any particular time; the social position, and habits of the patient. It is only in young persons that curative changes can be at all expected. Those who are so circumstanced, that they can live quietly, without either the anxiety or the labor arising from having to provide day by day for themselves and their families, and can have a suitable diet, have a much better chance of length of life than those not so fortunately situated. Laborious occupations are especially injurious. Continuance in evil habits, such as intemperance or debauchery, will necessarily render the prognosis more unfavorable.

GENERAL TREATMENT.

Very seldom can any hope be entertained of curing a chronic cardiac affection, but undoubtedly much may be done in the way of prolonging life, averting further mischief in the heart, warding off unpleasant or dangerous symptoms, and relieving them when they arise. Before considering the principles of treatment which require attention, it is requisite to remark that after any acute affection involving the heart, the patient should be kept strictly under observation until the organ has resumed its normal condition, so far as is possible, while any chronic case ought to be kept constantly under medical supervision. Different forms of heart disease may indicate particular modifications as to their management; but it will be sufficient here to point out the main principles which apply to all varieties more or less, and, when occasion requires, call attention to anything in the treatment of special affections which needs comment.

1. *General hygienic management* is of essential importance. A patient suffering from heart disease should, if possible, give up any laborious employment, especially if this has evidently originated and is increasing the mischief. At the same time a warning should be given against all forms of severe exercise, especially such as involve sudden effort; it is as well to give special instructions against running or walking hurriedly, and straining at stool. In some instances *complete rest* should be enforced for a time, which often produces a marked improvement in the state of the heart. Many cases, however, are benefited by more or less exercise, or, at all events, by being in the open air during some portion of the day, and carriage driving is often useful. Many patients can go about their usual avocations without any harm resulting, if these are of a satisfactory character. The question of the amount of exercise to be permitted must be determined by the actual conditions present, and the effects which it produces, and it may be stated generally that, in proportion to the degree of *dilatation* or *degeneration* present is the capacity for effort diminished. These lesions, if extensive, and *aortic regurgitation*, imperatively forbid any great exertion. It is very important further to avoid all causes of *mental* disturbance. Anxiety and mental strain or excitement in connection with pecuniary matters, business, politics, excessive study, &c., and all strong emotions must be carefully shunned, and a proper amount of sleep should be habitually obtained. Warm clothing is requisite, but there must be no pressure

or constriction about the chest or neck; cold sponging of the skin is often useful, if it is well borne. All injurious habits which depress the nervous energy of the heart, such as abuse of alcohol, tobacco, or tea, late hours, or venereal excesses, must be prohibited, and close inquiry may be necessary with regard to various matters, in order to detect mischievous habits. Change of air to a moderately warm and rather bracing climate frequently does good.

2. It is most needful to attend to the *diet* in every particular, and to the *state of the digestive organs.* When there is degeneration of the heart, a very nutritious diet is indicated, containing abundant protein elements, if these can be digested, but anything which gives rise to indigestion must be avoided. Milk and cream are exceedingly useful articles in many cases. As to alcoholic stimulants, no rule can be laid down, but a moderate quantity is generally beneficial, and there are not unfrequently symptomatic indications, calling for considerable amounts. The bowels should be kept freely acting. Remedies for improving the tone of the stomach and removing dyspepsia, are frequently very serviceable, especially by relieving flatulence, which mechanically interferes with the heart's action.

3. If there is any *constitutional diathesis,* such as gout or syphilis, treatment directed against this is often beneficial. One of the most essential matters in cardiac disease, is to look to the *state of the blood,* and if there is any indication of *anæmia,* to give some preparation of *iron.* Indeed, independently of this, this drug is frequently of considerable value, especially in the form of tincture. Other tonics are useful in many cases, such as quinine and mineral acids, strychnine or tincture of nux vomica, especially if there is degeneration of the heart or want of tone.

4. Excellent therapeutic observations have been carried on during the last few years as regards the effects of certain powerful medicinal agents upon the heart. Of these *digitalis* requires especial notice. Experiments have shown that the effects of digitalis upon the heart are not to paralyze it, as was formerly supposed, but to render the ventricular contractions more powerful and complete, less frequent, and more regular. Hence the periods of rest between the contractions are longer, the blood is driven more forcibly and in greater quantity into the aorta, the aortic

recoil is promoted, and thus the nutrition of the cardiac walls improved (Fothergill).

There are considerable differences of opinion as to the cases in which digitalis is indicated, and as to its mode of administration. The following observations may serve to convey the main practical facts with regard to the use of this drug, partly founded on the statements of others, and partly on my own clinical observation.

(i.) In all cases where digitalis is given, its effects should be carefully watched, especially as regards cardiac action, the state of the pulse, the urine, and any dropsy which may be present. When the action of the heart is rapid, irregular, ineffective, or embarrassed, the pulse being weak, the good results of the use of digitalis are seen in that it calms the heart, makes it act regularly and more vigorously, often relieving unpleasant local sensations, while the pulse is thus improved, becoming less frequent, stronger, fuller, and more regular. *Intermittency* has been considered by some as contraindicating digitalis, but though more than usual caution is required under such circumstances, yet it may be given in many cases with excellent results, and Fothergill is of opinion that it sometimes indicates a necessity for increasing the dose. If it appears to induce irregularity or intermittency, with much feebleness of pulse, digitalis should be discontinued. As regards the urine, this is often much increased in quantity, but only if dropsy is present (Ringer). Should it become diminished, this is considered an indication for stopping the drug. Its diuretic action is presumed to be due to the force of the heart being increased, and through this the arterial tension in the kidneys, by which the flow of water out of the vessels is promoted. The influence of digitalis on cardiac dropsy is often most marked, but not always. As signs which suggest the discontinuance of digitalis may be mentioned increase of unpleasant sensations about the heart, if evidently due to the drug; tendency to faintness; noises in the head; and persistent vomiting. It has been supposed to have a cumulative action, and may thus give rise to symptoms of poisoning suddenly.

(ii.) The forms in which digitalis is given are chiefly as the tincture or infusion, some preferring one, some the other. If it is required to act rapidly upon the heart, and especially to diminish dropsy, the freshly-made infusion is certainly the best; but the tincture is very useful for continuous administration. The powder of the leaves is also recommended, when it is required to keep up the action for some time, and if it cannot be taken internally, external applications of poultices of the leaves, or fomentations of the infusion may be beneficial, especially in promoting the flow of urine and diminishing dropsy. Digitalin has also been used, either internally or by subcutaneous injection. It is generally advisable to begin with a small dose (ʒj of infusion, or ♏x of tincture, twice or thrice daily), and gradually increase this, as well as the freqnency of administration, according as circumstances indicate. Digitalis is advantageously combined with other medicines, especially iron, various tonics, and diuretics. It may be necessary to continue the medicine for a long period, even for years, but it has appeared to me that it is in some cases better to intermit its administration for a time. In the less advanced cases, it often produces such good results, that it can be left off for considerable periods, but it should be again given, as soon as there are any signs of disturbed cardiac action. In very advanced cases, with general dropsy, the drug may lose its power, and the dose has often to be increased considerably in order to produce any effect, which is a bad omen.

(iii.) The cases in which digitalis is indicated or the reverse will now be noticed. *Simple hypertrophy* of the *left ventricle* only requires it when excessive, and when the heart is acting tumultuously or palpitates, or when it is insufficiently compensatory. The dose should be very small, and the effects closely watched, as symptoms of poisoning may speedily arise in these cases. In proportion to the degree in which *dilatation* becomes evident, and the heart's action consequently inefficient, does the drug generally become more valuable, much larger doses being required and being well borne. *Mitral disease*, and the changes in the heart resulting from this, are greatly benefited as a rule, the pulmonary and other symptoms associated with these conditions being also mitigated. It is especially when there is great irregularity that digitalis is so serviceable, and Dr. Ringer believes that the drug causes the musculi papillares to act more regularly, thus putting a stop to regurgitation which depends upon their disturbed action. Many object strongly to the use of digitalis if the *aortic orifice* is involved. I quite agree with those, however, who do not look upon this as a contraindication, provided the state of the ventricle is such as to require it, having frequently seen marked benefit following its administration; but in these cases close watching is necessary. The conditions due to *enlargement of the right heart*, with *tricuspid regurgitation*, when it exists alone, and results from pulmonary disease, are not improved by digitalis, unless there is irregularity in the cardiac action, and it may even do harm; when these morbid changes follow mitral disease, however, much good may be effected by its use.

Fatty degeneration is also looked upon by many as contraindicating digitalis, but with due precautions, I am convinced it may be given with marked benefit when this condition is present, should it be required, and it probably then acts by aiding the contraction of those fibres which are still healthy. *Extensive atheroma* has likewise been regarded as forbidding the employment of digitalis, and it certainly ought to be used with particular care in such a state of things. Bronchitic attacks associated with heart disease may be often much relieved by the use of digitalis, should there be palpitation, irregularity, or other evidences of cardiac embarrassment and inability. Its value in functional palpitation has already been alluded to.

Several other remedies influence the heart, viz., aconite, belladonna (both of which are very valuable in calming this organ, when it acts excitedly and violently), hydrocyanic acid, veratria, caffeine, scoparium, squill, &c. Some of these require to be given cautiously, as they are powerful agents.

5. Important questions suggest themselves, as to whether we possess any means of restoring the heart to its normal condition when in a state of disease, and whether it is desirable to use such means? As regards *valvular diseases*, it is useless to attempt to influence these by any therapeutic measures. With respect to the *diminution in size of a hypertrophied heart*, this is certainly not what ought to be aimed at, and it is more than doubtful whether it can be effected in the least; such means towards this end as repeated local bleedings, low dieting, severe purgation, and large

doses of iodide of potassium, are decidedly to be condemned, and our great object should rather be to maintain the nutrition of the heart as much as possible, and prevent it from becoming dilated. We have no direct means of influencing *dilatation*, except by improving the tone and vigor of the heart by food, tonics, and digitalis. It is quite possible that the nutrition of a *fatty heart* may be improved in some instances by good diet, tonics, and cod-liver oil.

6. Various *symptoms* arise in the course of a case of heart disease, demanding measures for their relief. Those more immediately connected with the heart are *pain and other unusual sensations, palpitation, angina pectoris*, and *faintness* or *syncope*. Abnormal sensations are often much relieved by wearing a belladonna plaster, and many patients are never comfortable except when they have one on. Sometimes belladonna liniment is very useful. The treatment of the other symptoms has been already pointed out. With regard to palpitation, attended with dyspnœa, this is in some instances much quieted by subcutaneous injections of a very small quantity (gr. $\frac{1}{12}$ to $\frac{1}{8}$) of morphia, which is supposed to relieve spasm of the arterioles, this giving rise to the palpitation (Fothergill). Aconite, in minute doses, is also recommended strongly by Ringer and others. Pulmonary symptoms must be treated by the usual methods, but they are often greatly relieved by acting on the heart through digitalis. Needless cough should decidedly be subdued, but often it is necessary to promote expectoration. Cardiac dyspnœa may in many cases be influenced by digitalis, or may require various sedatives and antispasmodics. Any obvious cause giving rise to it, such as flatulence, should be at once got rid of, and it is generally diminished by making the patient sit up in bed, thus removing any pressure on the diaphragm from below.

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being hastened, however, by pulmonary complaints, nervous disturbances, and other causes.

TREATMENT.—All that can be done is to attend to hygienic measures carefully, including moderate exercise, baths with friction, and the wearing of warm clothing, with flannel next the skin; to give plenty of good food, especially of a hydrocarbonaceous kind, including a small quantity of some alcoholic stimulant; and to treat anything calling for special attention. Iron and other tonics, with cod-liver oil, are often beneficial. A dry, warm climate is desirable, and every source of cold must be avoided.

CHAPTER XXIII.

DISEASES OF BLOODVESSELS.

ARTERITIS.—INFLAMMATION OF ARTERIES.—ATHEROMA, &c.

Acute arteritis is chiefly observed in connection with the aorta (aortitis), and probably it occurs in the course of blood-affections more frequently than is generally recognized. It is characterized *anatomically* by injection of the vasa vasorum, thickening and softening of the coats, cloudiness and loss of polish of the inner surface, which becomes rough from fibrinous deposit.

SYMPTOMS.—The symptoms which have been described in connection with aortitis are pain, sometimes extreme, accompanied with much tenderness, or superficial hyperæsthesia; a sense of heat and throbbing; severe constitutional disturbance and restlessness; sometimes a tendency to syncope, and dread of death. The *physical signs* are objective pulsation, and occasionally a thrill and murmur, synchronous with the cardiac systole. In the smaller arteries inflammation might lead to complete plugging, but a clot may be the cause of inflammation.

CHRONIC ARTERITIS is an important morbid process, and is now generally looked upon as being the origin of the condition known as *atheroma*, this being preceded by a *parenchymatous inflammation*, affecting the inner coat (*endarteriitis deformans*).

ETIOLOGY.—The chief causes of atheroma are—1. Local injury a *single ventricle*, and then divides into two. 6. The ductus arteriosus is often pervious.

Some of these conditions are met with together, being in fact the necessary consequences of each other. Thus the most common malformation observed is *constriction of the pulmonary orifice*, with an *open foramen ovale*, and a *pervious ductus arteriosus*, through which the blood passes from the aorta into the pulmonary artery, some of it also reaching the lungs through enlarged bronchial arteries. If the *aorta* is closed, the foramen ovale and ductus arteriosus remain open, and the blood is conveyed by the latter from the pulmonary artery into the aorta.

SYMPTOMS.—It will be noticed, on studying the changes mentioned, that they may disturb the circulation in one or more of three ways, viz.: 1st. By allowing a free intermixture of venous and arterial blood. 2dly. By obstructing the circulation, and especially interfering with its passage into the lungs, while the venous system is overloaded; or with its return from these organs. 3dly. By making the systemic circulation entirely venous, the pulmonary entirely arterial, when the arteries are transposed. Some of the conditions are quite incompatible with life for any length of time. In other cases patients may live many years, even up to twenty or more, and the symptoms may not declare themselves for a considerable time after birth. It is unnecessary to describe them, as they are simply those associated with deficient blood-oxygenation, and general venous stagnation, which have already been fully considered, and which are presented in these cases in their most intense degree. With regard to the discoloration, it may be blue, leaden, purple, livid, or of a claretty hue, often mottled, and is very marked in the lips, ears, fingers, and toes. It is intensified by anything which increases the difficulty in the circulation, such as crying, coughing, &c. Much discussion has been carried on as to its cause, but it is probably the combined effect of intermixture of venous and arterial blood, venous stasis, and imperfect arterialization. Fits of palpitation are common, often with extreme irregularity, and a disposition to syncope or coma. Dyspnœa, cough, and other lung symptoms are also frequent, these organs being liable to various morbid changes.

The *physical signs* will vary much, according to the morbid condition present. If the orifices or valves are affected, there will be corresponding murmurs, and *pulmonary murmur* is most common in these cases. It is questionable whether a patent foramen ovale can give rise to a murmur. In time signs of hypertrophy and dilatation or degeneration are very likely to be observed.

The *duration* of cases of congenital cyanosis is very variable, and they sometimes linger a long while, apparently becoming accustomed to their semi-asphyxiated state. Death is never sudden, but usually gradual, doses of iodide of potassium, are decidedly to be condemned, and our great object should rather be to maintain the nutrition of the heart as much as possible, and prevent it from becoming dilated. We have no direct means of influencing *dilatation*, except by improving the tone and vigor of the heart by food, tonics, and digitalis. It is quite possible that the nutrition of a *fatty heart* may be improved in some instances by good diet, tonics, and cod-liver oil.

6. Various *symptoms* arise in the course of a case of heart disease, demanding measures for their relief. Those more immediately connected with the heart are *pain and other unusual sensations*, *palpitation*, *angina pectoris*, and *faintness* or *syncope*. Abnormal sensations are often much relieved by wearing a belladonna plaster, and many patients are never comfortable except when they have one on. Sometimes belladonna liniment is very useful. The treatment of the other symptoms has been already pointed out. With regard to palpitation, attended with dyspnœa, this is in some instances much quieted by subcutaneous injections of a very small quantity (gr. $\frac{1}{12}$ to $\frac{1}{8}$) of morphia, which is supposed to relieve spasm of the arterioles, this giving rise to the palpitation (Fothergill). Aconite, in minute doses, is also recommended strongly by Ringer and others. Pulmonary symptoms must be treated by the usual methods, but they are often greatly relieved by acting on the heart through digitalis. Needless cough should decidedly be subdued, but often it is necessary to promote expectoration. Cardiac dyspnœa may in many cases be influenced by digitalis, or may require various sedatives and antispasmodics. Any obvious cause giving rise to it, such as flatulence, should be at once got rid of, and it is generally diminished by making the patient sit up in bed, thus removing any pressure on the diaphragm from below.

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or constriction about the chest or neck; cold sponging of the skin is often useful, if it is well borne. All injurious habits which depress the nervous energy of the heart, such as abuse of alcohol, tobacco, or tea, late hours, or venereal excesses, must be prohibited, and close inquiry may be necessary with regard to various matters, in order to detect mischievous habits. Change of air to a moderately warm and rather bracing climate frequently does good.

2. It is most needful to attend to the *diet* in every particular, and to the *state of the digestive organs*. When there is degeneration of the heart, a very nutritious diet is indicated, containing abundant protein elements, if these can be digested, but anything which gives rise to indigestion must be avoided. Milk and cream are exceedingly useful articles in many cases. As to alcoholic stimulants, no rule can be laid down, but a moderate quantity is generally beneficial, and there are not unfrequently symptomatic indications, calling for considerable amounts. The bowels should be kept freely acting. Remedies for improving the tone of the stomach and removing dyspepsia, are frequently very serviceable, especially by relieving flatulence, which mechanically interferes with the heart's action.

3. If there is any *constitutional diathesis*, such as gout or syphilis, treatment directed against this is often beneficial. One of the most essential matters in cardiac disease, is to look to the *state of the blood*, and if there is any indication of *anæmia*, to give some preparation of *iron*. Indeed, independently of this, this drug is frequently of considerable value, especially in the form of tincture. Other tonics are useful in many cases, such as quinine and mineral acids, strychnine or tincture of nux vomica, especially if there is degeneration of the heart or want of tone.

4. Excellent therapeutic observations have been carried on during the last few years as regards the effects of certain powerful medicinal agents upon the heart. Of these *digitalis* requires especial notice. Experiments have shown that the effects of digitalis upon the heart are not to paralyze it, as was formerly supposed, but to render the ventricular contractions more powerful and complete, less frequent, and more regular. Hence the periods of rest between the contractions are longer, the blood is driven more forcibly and in greater quantity into the aorta, the aortic

recoil is promoted, and thus the nutrition of the cardiac walls improved (Fothergill).

There are considerable differences of opinion as to the cases in which digitalis is indicated, and as to its mode of administration. The following observations may serve to convey the main practical facts with regard to the use of this drug, partly founded on the statements of others, and partly on my own clinical observation.

(i.) In all cases where digitalis is given, its effects should be carefully watched, especially as regards cardiac action, the state of the pulse, the urine, and any dropsy which may be present. When the action of the heart is rapid, irregular, ineffective, or embarrassed, the pulse being weak, the good results of the use of digitalis are seen in that it calms the heart, makes it act regularly and more vigorously, often relieving unpleasant local sensations, while the pulse is thus improved, becoming less frequent, stronger, fuller, and more regular. *Intermittency* has been considered by some as contraindicating digitalis, but though more than usual caution is required under such circumstances, yet it may be given in many cases with excellent results, and Fothergill is of opinion that it sometimes indicates a necessity for increasing the dose. If it appears to induce irregularity or intermittency, with much feebleness of pulse, digitalis should be discontinued. As regards the urine, this is often much increased in quantity, but only if dropsy is present (Ringer). Should it become diminished, this is considered an indication for stopping the drug. Its diuretic action is presumed to be due to the force of the heart being increased, and through this the arterial tension in the kidneys, by which the flow of water out of the vessels is promoted. The influence of digitalis on cardiac dropsy is often most marked, but not always. As signs which suggest the discontinuance of digitalis may be mentioned increase of unpleasant sensations about the heart, if evidently due to the drug; tendency to faintness; noises in the head; and persistent vomiting. It has been supposed to have a cumulative action, and may thus give rise to symptoms of poisoning suddenly.

(ii.) The forms in which digitalis is given are chiefly as the tincture or infusion, some preferring one, some the other. If it is some cases the signs are so evident, that there is but ficulty in making out all that is required; but the follow- ses of difficulties are met with, viz.: 1. There may only ptoms indicating more or less pressure within the thorax, etimes merely obscure and ill-defined sensations, with con- onal disturbance, but *no external signs*. 2. An aneurism give rise to the physical signs of a *tumor*, but *without any tion or murmur*. 3. Other *pulsating prominences* are occa- ally observed besides aneurisms, the pulsation being usually nsmitted from the heart or aorta.

The morbid conditions which aortic aneurism may simulate, or *ce versâ*, are *solid mediastinal tumors* or abscess (which may ulsate); pulsating empyæma; phthisical consolidation at the left apex, with subclavian or pulmonary murmur; swelling over the sternum from chronic periostitis or abscess, or tumors or suppuration in other parts of the chest-walls; pericardial effusion; *innominate aneurism*; *cardiac disease*. Among very rare conditions may be mentioned coarctation of the aorta, varicose aneurism, and aneurism of the pulmonary artery.

The points to be taken into account are as follows: 1. The age and sex of the patient; previous history, especially with regard to *occupation*, family history, and that of the origin and progress of the complaint. 2. The presence or absence and exact characters of pressure-signs. 3. The other symptoms observed, particularly noting whether there is *general dropsy* or *albuminuria*. 4. The exact situation of any prominence. 5. Should there be any pulsation, attention must be paid to its precise site, extent, rhythm, and characters, especially as to whether it is *heaving and expansile*, double, or attended with thrill, and if it is distinct from the *cardiac pulsation*. 6. With regard to dulness, it is necessary to notice its site and extent, especially whether it is in the course of the aorta, or crosses the middle line, and if it corresponds most to any pulsation which may be evident. 7. The presence and characters of murmurs are very important, but these must not be mistaken for *conducted cardiac murmurs*. 8. Examination of the pulse may afford aid, especially by the sphygmograph; and also the effects of pressure upon the great vessels in the neck.

The distinctions between aneurism and a solid tumor will be hereafter considered. With regard to the heart, the chief difficulties are, that aneurism may be simulated by enlargement of this organ with valvular disease, and especially if the aorta is atheromatous; or that an aneurism with very thin walls and fluid contents, pushing the heart down and to the left, may be mistaken for mere cardiac enlargement. The principal circumstances in favor of cardiac disease are, there being but one centre of impulse; the physical signs being in the region of the heart, or most marked here; the absence of pressure-symptoms; and the presence of general dropsy or albuminuria.

As regards the *form of an aneurism,* the signs in favor of *general fusiform dilatation* are given by Walshe as more diffuse pulsation, both above and below the clavicle; well-marked thrill; rough, prolonged, rasping, whizzing, or whirring murmur, systolic, audible along the arch, or louder there than over the aortic orifice; and absence or slight degree of pressure-signs.

The *part of the vessel* affected must be determined by the locality of the physical signs, and the exact pressure-signs observed; comparison of the radial pulses, especially as revealed by the sphygmograph, may afford aid. In distinguishing *innominate aneurism* from *aortic,* the following considerations have weight: The physical signs correspond to the region of the innominate artery; the prominence appears early, and it may displace the clavicle; it is said that dysphagia and dyspnœa from pressure are rare, but I have known both these symptoms extremely severe; there are often signs of pressure on the nerves of the right brachial plexus, and on the right bronchus; the *right radial pulse* is always modified; and pressure on the carotid and subclavian arteries on the same side diminishes the pulsation.

Treatment.—The first object in treatment should be to endeavor to bring about a cure by promoting coagulation, but this can only be aimed at in the case of a sacculated aneurism. Failing this, it is necessary to protect it, retard its development as much as possible, and treat the symptoms and complications which so frequently arise.

If it is intended in any case to attempt to induce a cure, it is absolutely essential to keep the patient at rest, in the recumbent posture, for a considerable time, and to avoid every source of mental disturbance. Formerly it was the custom to have recourse to starvation, and repeated venesection, but at the present day this has been with good reason modified into a *careful regulation of diet,* a definite quantity of solids and liquids being administered at stated intervals, according to Mr. Tufnell's method. The exact amounts must depend upon each individual case, but everything should be strictly weighed or measured, the object being to support life with as little food and drink as possible, without inducing nervous irritability. Excess of fluid must be especially avoided, and all stimulants are to be prohibited. In some instances it may be advisable to remove a little blood from time to time, but it is very important to avoid inducing an anæmic condition.

The objects of this attention to rest and diet are to calm the circulation as much as possible, and to render the condition of the blood more favorable for coagulation, and undoubtedly some cases do improve considerably under this treatment alone. *Medicinal agents,* however, may be employed with benefit at the same time, viz., those which calm and regulate the heart's action, such as digitalis, aconite, or belladonna; and those which promote coagulation, particularly gallic or tannic acid, tincture of steel, acetate of lead, and iodide of potassium. The last has been very well spoken of by Dr. Roberts of Manchester and Dr. Balfour of Edinburgh, when given in large doses, even as much as from 15 to 30 grains thrice daily, and continued for a long period. Some employ watery purgatives, in order to remove the watery portion of the blood, but this treatment is of questionable efficacy.

It is necessary to mention certain operative procedures to which recourse has been had, with the view of curing aortic aneurism. These are—1. Injection of perchloride of iron into the sac. 2. Manipulation of the sac externally. 3. Galvano-puncture. 4. Introduction of a quantity of fine iron wire through a canula.

It would occupy too much space even to mention the various symptoms and complications which may require attention in the progress of a case of aneurism; only a few practical points can be alluded to here. It is always well to keep the aneurism covered with cotton-wool, and should it be particularly prominent, some kind of protecting shield might be worn. For relieving pain and procuring sleep, the chief internal remedies are opium, hyoscyamus, lactucarium, hydrate of chloral, and conium. Subcutaneous injection of morphia is most valuable. *External applications* are also useful, such as belladonna or opium plaster; belladonna or aconite liniment; cold poultices of linseed-meal and vinegar, of conium, digitalis, or oak-bark (Walshe); ice, ether-spray, or chloroform cautiously applied; counter-irritation by flying blisters or iodine, which sometimes gives marked relief. If there are *severe laryngeal symptoms*, evidently due to pressure on the recurrent nerve, it is decidedly justifiable to perform tracheotomy. It has been suggested that in some cases the sterno-clavicular ligaments might be divided, in order to allow displacement of the clavicle forwards.

CHAPTER XXIV.

MEDIASTINAL TUMORS.

Aortic aneurism is the most frequent form of mediastinal enlargement, and therefore it has appeared to me best to introduce what has further to be said on the subject in this place. The other chief varieties are *cancer* (either encephaloid or scirrho-encephaloid), originating in the œsophagus, glands, root of lung, or thymus gland; fibro-cellular, fibrous, or fibro-fatty tumors; enlarged masses of glands in tuberculosis, or Hodgkin's disease; inflammatory exudation and abscess; or very rarely masses of steatoma, or hair.

SYMPTOMS AND SIGNS.—The symptoms are mainly those of pressure, as already mentioned, and they accordingly present the usual variations; "currant jelly" expectoration is said to be common in cancer. There may be constitutional symptoms of this diathesis. The *physical* signs of a *solid tumor* are also widely different, but the following list may give some notion as to those which are to be sought for. 1. *Local bulging*, especially in front, of variable extent, often irregular, not pulsating as a rule. This, however, is frequently absent. 2. *Deficiency or absence of respiratory movements* over the seat of enlargement, and in some instances over one side, from pressure on a bronchus. 3. *Altered percussion-sound*, often over a considerable area, it being dull and toneless, hard, wooden, and high-pitched, or occasionally tubular or amphoric; with marked resistance. 4. *Respiratory sounds* weak or absent, blowing, or tubular, according to the relation of the enlargement to the main tubes. 5. *Vocal fremitus* usually absent, and *resonance* either deficient, bronchophonic, or pectoriloquous. 6. Frequently *dry* and *mucous râles in the bronchi*. 7. *Displacement of the heart* and other structures; increased conduction of the heart-sounds; and occasionally a murmur from pressure on a great vessel.

DIAGNOSIS.—*Mediastinal tumor* has first to be distinguished from other morbid conditions in the chest, and those mentioned by Walshe are chronic pneumonia, chronic pleuritic effusion, pericardial effusion, and enlargement of the heart. Careful consideration of the history of the case, its symptoms, physical signs, and progress, will rarely leave much doubt as to the diagnosis thus far. It is much more difficult, however, to determine *the nature* of any mediastinal enlargement. In the diagnosis of any doubtful case, as between aneurism and a solid tumor, which is usually cancerous, the following considerations have weight, these having been chiefly compiled from the observations of Dr. Walshe: 1. The fact of the patient being a female, and under 25, points to a solid tumor; the family history may be suggestive of cancer; or the occupation may be in favor of aneurism. 2. As regards *symptoms*, dysphagia, severe pain, especially behind, are more common in aneurism; œdema of the arm and chest, frequent hæmoptysis, and especially currant-jelly expectoration, in tumor. Occasionally cancer-elements may be discharged in the sputa. 3. The *physical signs* are of much value. The limitation of these to the region of the aorta, presence of any thrill, double impulse, and especially with doubling of the diastolic share, and gradual approach of any pulsation to the surface, are suggestive of aneurism; great superficial extent of dulness, absence of any heaving character in the pulsation, should this present, and the want of accordance between it and the maximum dulness, are in favor of tumor. 4. Careful examination may reveal cancer in other parts, or there may be constitutional evidences of its presence.

As regards distinguishing different solid enlargements from each other, all that can be stated is, that cancer is the most common; there may be evidence of the cancerous cachexia, or of cancer in other parts; and free hæmoptysis is by far most frequent in this form of tumor, or cancer-cells may be expectorated. It also grows outwards, and has a rapid progress.

TREATMENT.—All that can be done is to relieve symptoms as they arise.

CHAPTER XXV.

ON CERTAIN ABNORMAL CONDITIONS OF THE BLOOD.

THE blood is liable to numerous deviations from a healthy state, but of these alterations, though interesting and important, the limits of this work will only permit a general outline, except in some particular instances. The changes observed may be arranged as follows:

I. *In the absolute quantity of the blood.* 1. *Plethora*, when it is excessive. 2. *Hyperæmia*, or *anæmia*, when deficient. II. *In obvious physical characters, e. g.*, the blood may be unusually pale and watery, dark from pigment, thick and tarry, or the serum has sometimes a milky appearance, due to the presence of fat. III. *In the quantity and characters of the corpuscles.* 1. The red corpuscles may be (*a*) deficient (oligocythæmia); (*b*) in excess (polycythæmia); or (*c*) altered in shape and size, or in their tendency to, and mode of mutual adhesion. 2. The white corpuscles are often too numerous, but this is particularly seen in the condition named *leucocythæmia*, which will be considered under splenic diseases. IV. *In the normal chemical constituents.* 1. Fibrin may be (*a*) increased (hyperinosis); (*b*) diminished (hypinosis); or (*c*) altered in its tendency to coagulate. 2. Albumen is frequently deficient, sometimes above the normal. 3. Water may be excessive (hydræmia), or the reverse. 4. A diminution in alkaline or earthy salts, especially those of potash and lime, is considered important in some diseases; occasionally they are increased. 5. Fatty elements, particularly cholesterin, may be present in unusual quantity. V. *Abnormal chemical substances* are often found in the blood, or, at all events, such as are usually present in so small a quantity as to be detected only with difficulty and to be practically harmless, *e. g.*, lactic, uric, formic, and other organic acids; leucin and tyrosin; urea and its products; bile elements; and certain metals. VI. *Abnormal microscopic particles* are also not uncommonly observed, such as abundant pigment-granules (melanæmia), pus-corpuscles, animal or vegetable parasites.

In numerous instances more than one form of deviation is observed.

ANÆMIA—SPANÆMIA—CHLOROSIS.

The term *anæmia* is used very vaguely, and, in addition to its strictly literal sense, it is applied in practice to three classes of cases, viz.: Where the blood is deficient in quantity; where it is abnormal in quality; and where the arteries are inadequately filled. These conditions, however, are usually more or less combined. The chief alterations in quality are deficiency of red corpuscles, and often of albumen; excess of water and salts, the serum having a low specific gravity. Fibrin is proportionately high, and the blood has a tendency to coagulate in the veins. *Chlorosis* or *green sickness* merely signifies that there is a peculiar greenish tint, such as is frequently observed in anæmic girls, associated with menstrual derangements, and which is supposed to depend upon some chemical change in the blood coloring-matter.

ETIOLOGY.—Very many causes may give rise to anæmia, but the chief include considerable loss of blood at one time, or repeated small losses; bad hygienic conditions, especially constant sedentary or laborious employment in a confined atmosphere, with deficiency of sunlight; improper or insufficient food, particularly a want of animal diet; impaired power of digestion; excessive drains upon the system, such as overlactation, diarrhœa, suppuration, &c.; prolonged exposure to malarial influence, with or without attacks of ague; various chronic diseases which interfere with nutrition, *e. g.*, phthisis, cancer, renal or splenic disease, gastric ulcer, &c.; acute febrile diseases; excessive venery or masturbation; depressing mental influences; chronic poisoning by lead, mercury, and other metals. In many instances several of these causes have combined in inducing anæmia. A pale anæmic aspect is not uncommonly a striking feature in those suffering from mitral or aortic disease, but this is partly due to insufficient filling of the arteries.

It is in females, especially from 15 to 25 years of age, that anæmia or chlorosis is most frequently observed. This has been supposed to be mainly the result of the great demands on the developmental powers about the period of puberty, but commonly it will be found in the history of these cases that there are some other obvious causes, which at all ve aided materially in giving rise to the anæmic condition, the ortant being *long-continued habitual constipation*, which neces- is to derangement of the digestive organs, and consequent im- trition; and *abstinence from animal food*, this being the conse- the loss of appetite or rather disgust for food, which is neces- ociated with the bad state of the alimentary canal. Other are also frequently active in these cases, such as deficient ex- se confinement, overwork (particularly with some sewing ma- and mental depression.

oms.—The appearance of persons suffering from anæmia is, as a iently characteristic. They are pale, often waxy, and with a sparent skin, or, as already mentioned, a greenish or yellowish- e is observed in chlorotic girls. The veins are often very evi- have a peculiar pinkish tint. The *mucous membranes* should, be particularly looked to, especially the conjunctiva of the elid, and the membrane covering the lips, gums, and tongue, g more or less pale and bloodless. The sclerotics appear clear h. The general condition will vary according to the cause of ia; in chlorosis the patient is often apparently well nourished, he tissues are usually flabby and wanting in tone. Œdema ankles, and puffiness of the eyelids in the morning are com- there may even be considerable anasarca of the legs after some time The effect of anæmia in promoting dropsy from ses has been previously alluded to.

jective sensations complained of are also very uniform in chlo- s. These are debility, languor, and incapacity for exertion; hilliness and coldness of the extremities; *shortness of breath tation* after any effort, or even without this; sometimes a ten- syncope; headache, dizziness, and noises in the ears; neuralgic rical pains in different parts of the body, but especially *in the* this being frequently accompanied with tenderness, and being come and go. It has seemed to me that this pain in the left possibly be connected with the spleen in some cases. Anæmic re often low spirited or irritable, and subject to hysteria.

gestive organs are usually at fault. Appetite is impaired or de- and there may be an absolute disgust for food, especially meat. a and atonic dyspepsia are common. The bowels are obsti- nstipated, as a rule. Hæmatemesis and melæna occasionally *Menstruation* is almost always deranged, being absent, infre- regular, scanty, unhealthy, painful, or sometimes menorrhagic. ia is frequently present.

abnormal *physical signs* are observed in marked anæmia, ve been already described, viz., *systolic murmur at the base of blowing murmur in the arteries*, especially the subclavian, sometimes *thrill; venous hum*, which is in some cases even heard over the cranium, and may also be accompanied by a *thrill*. The heart's action is very liable to be disturbed, becoming easily excited and hurried, and, in severe cases, even irregular. The *pulse* is small, feeble, and compressible, or sometimes scarcely perceptible.

The *urine* frequently presents important changes, being pale and watery, excessive in quantity, of low specific gravity, deficient in acidity, with a marked decrease in the amount of pigment.

It is believed that anæmia may ultimately give rise to organic diseases, such as phthisis, or gastric ulcer; acute affections occurring in anæmic individuals are apt to assume a low type, and to be followed by protracted convalescence.

TREATMENT.—The first thing to be done in all cases of anæmia, is to find out its causes, and remove these if possible. Attention to *hygienic conditions* is most essential, especially in the case of chlorotic girls. Fresh air, good light, outdoor exercise, avoidance of late hours, and of hot and crowded rooms, change of air and scene to some dry and bracing climate, especially to the seaside, cheerful society, and the removal of all disturbing mental influences, are most efficient aids in treatment. Baths, particularly in sea-water, or douches, with friction afterwards, are very beneficial, if followed by good reaction. It is also most important to look to the *diet*, and to the *state of the digestive organs*. Nutritious food must be given at frequent intervals, and it is often requisite to give strict instructions on this matter, particularly with regard to *meat*, to which these patients have a strong objection. It ought to be taken underdone, and, if it causes pain, it may be pounded. Nutritious soups are also useful, and beer or wine is generally indicated. The *state of the bowels* demands particular notice, and the patient should be fully impressed with the necessity of having a *proper stool daily*. Aloes is one of the best forms of aperient in these cases, given at night, in the form of pill aloes c. myrrh, or as extract. Remedies for the stomach are frequently very beneficial also, bismuth with hydrocyanic acid being particularly valuable in relieving the unpleasant and painful sensations connected with this organ, when taken shortly before meals.

Iron in some form is the great remedy in anæmia. The mist. ferri. co. is eminently efficacious in chlorosis, and other excellent preparations are the pill, or saccharated powder of carbonate, the ammonio-citrate, and the ferrum redactum. The tincture of the sesquichloride is invaluable in many cases, especially when the anæmia is associated with excessive discharges. The solution of the pernitrate, phosphate, sulphate, and magnetic oxide are also very useful preparations, and, in anæmic children, steel wine and the tartrate produce excellent results. Chalybeate waters are beneficial in some instances. Iron may be combined with infusion of quassia or calumba, or with quinine, or strychnine, and some recommend it to be given with arsenic, manganese, pepsin, and other remedies. The citrate of quinine and iron, and Easton's syrup, are very valuable preparations. It is frequently desirable to change the form of administration from time to time, or even to stop the iron temporarily, should it appear to disagree.

The pain in the side often requires attention in chlorosis, and usually it is much relieved by wearing a belladonna plaster.

PYÆMIA—SEPTICÆMIA.

This is a subject belonging principally to surgery, and it is not proposed to enter fully into its consideration here, but merely to indicate the chief facts with regard to the affection, as it sometimes occurs in medical practice.

ETIOLOGY.—Excluding obvious injuries and operations, the causes of pyæmia or septicæmia, as these affections come under the notice of the physician, are as follows: 1. Disease of bones, either acute or chronic, leading to suppuration; it may thus arise from disease of the temporal bone. 2. Affections of the heart or vessels, originating septic materials, which contaminate the blood, *e. g.*, endocarditis, softening of clots, especially in the veins, phlebitis. 3. Formation of abscesses, or gangrene in any part, either external to, or within organs. 4. Ulceration of mucous surfaces, *e. g.*, the gall-bladder or its duct, and the intestines. 5. Inflammation of a low type, and attended with suppuration, in the pelvis of the kidney, bladder, or urinary passages. 6. Diseases giving rise to external inflammation of an unhealthy character, with the formation of pus, especially the different varieties of erysipelas, variola, *vaccinia in revaccination*, malignant pustule, glanders, carbuncles or boils, and under this class may be also mentioned dissection-wounds. 7. Pyæmia occasionally arises in low fevers, such as typhus, without there being any evident local source of blood-poisoning. 8. It is stated to be *idiopathic* in rare instances, but it must be borne in mind that pyæmia may follow a very slight injury in unhealthy subjects, and that there are many internal causes which might escape observation.

ANATOMICAL CHARACTERS.—It is highly probable that death may occur from pyæmia, without there being any characteristic post-mortem appearances. The morbid changes which it tends to produce may be summed up thus; 1. Great *congestion* throughout the various organs and tissues of the body. 2. *Hemorrhages*, in the form of petechiæ or vibices in connection with the skin, mucous and serous membranes, or actual escape of blood into the cavity of the last-mentioned; extravasations into muscles and among deep tissues; and apoplectic clots in the substance of organs, which are prone to undergo rapid changes. 3. *Acute inflammation* in the solid organs, of a low type. 4. *Formation of abscesses* in them,

considerable number, of good size, and containing unhealthy pus,
ng either from hemorrhagic clots, inflammation, or sloughing.
ngrene of portions of organs. 6. *Low serous inflammations*, with a
ncy to purulent effusion, which may be limited in abscesses, and the
uction of unhealthy lymph. 7. *Inflammation of mucous surfaces*,
ing to the discharge of pus, ulceration, and sometimes to submucous
cesses, or gangrene. 8. *Severe inflammation of joints*, with a great
dency to rapid formation of pus, and destruction and disorganization
tissues, both within and around the joints, several of them being usually
volved. 9. *Inflammation and formation of abscesses in various parts of*
e body, within muscles, in the cellular tissue, either superficial or deep,
nd sometimes in the skin itself, giving rise to pustules.

Symptoms.—In many instances pyæmia reveals itself very insidiously,
but its characteristic symptoms in an acute case are mainly these: Rigors
come on abruptly, severe and prolonged in character, and repeated at
irregular intervals. The temperature often rises rapidly to a high point,
and it is usually very elevated throughout, but *subject to marked and extremely*
irregular changes. Profuse sweating follows the rigors, in the
intervals the skin being hot, dry, and harsh. There is a marked expression
of illness, and a tendency to early prostration, combined with restlessness
or heaviness. The skin soon appears sallow and yellowish, and
frequently considerable jaundice sets in; congestion and petechiæ may
often be seen, and sometimes sudamina, or a vesicular or pustular eruption.
The digestive organs are usually much disturbed from the outset,
there being anorexia, great thirst, nausea, and vomiting, frequently with
a glazed or furred and irritable tongue, and in some cases fetid diarrhœa.
The pulse is frequent, feeble, and liable to rapid variations. Respiration
is also hurried, and the breath has a peculiar odor in some cases. Albuminuria
is not uncommon.

In a short time the symptoms and signs of the *local lesions* may appe
in various parts, necessarily differing according to the structures whi
are affected: the joints are involved with considerable frequency, beco
ing very painful and swollen. The further tendency is towards
and extreme prostration and adynamia, with low nervous symptoms
face becoming pale and pinched; the heart's action exceedingly
weak, irregular, and intermittent, as evidenced by the impulse,
and pulse; the tongue brown and dry, with sordes on the teeth and
delirium, coma, or rarely, convulsions setting in at last, with invo
discharge of fæces and urine.

In some instances pyæmia is evidenced chiefly by its general sy
in others it runs a somewhat chronic course, and may then end in
Instances will be hereafter mentioned in which some authoritie
certain diseases to a *local pyæmia*.

Diagnosis.—It is important to distinguish pyæmia from va and acute inflammatory affections which it may simulate, and to bear in mind its possible occurrence in connection with the morbid conditions mentioned under its etiology. In some cases its course of temperature makes it resemble ague.

TREATMENT.—The only chance for recovery is in the free and regular administration of nutritious food, stimulants, and tonics, especially mineral acids, bark, quinine, and tincture of steel. Antiseptics have been strongly recommended. Local lesions must be attended to as they arise.

CHAPTER XXVI.

THROMBOSIS AND EMBOLISM.

THE terms "thrombus" and "embolus" have been frequently used in the course of this work, and now it is intended to indicate the chief etiological, pathological, and clinical facts pertaining to each of these morbid conditions.

By *thrombosis* is meant a *local coagulation* of blood *during life*, either in the heart or a vessel, a clot being thus formed, named a *thrombus.*

Embolism signifies the partial or entire plugging of a bloodvessel by a *solid fragment* or *embolus conveyed from some distant part.*

I. THROMBOSIS.

ETIOLOGY.—The causes which tend to the formation of a thrombus may be thus stated: 1. *Anything which impedes or retards the blood-current, e. g.*, valvular and other organic diseases in the heart, pressure upon its cavities, or mere feeble cardiac action, such as is observed after fevers, or in various chronic wasting affections; affections of the lungs, impeding the pulmonary circulation; obstruction of a vessel by constriction, pressure, or internal plugging, especially by an embolus; pressure upon the capillaries of a part; solution of continuity of a vessel; and dilatation of vessels, particularly in aneurisms, varicose veins, and distended venous plexuses. A generally feeble state of the circulation, or gravitation may also contribute to the formation of a thrombus. 2. *Those which induce an abnormal condition of the inner surface of the heart, or of the coats of the vessels, e. g.*, acute inflammation, fissuring of the surface, atheroma, calcification, projection of cancerous and other new formations into the interior of vessels, and the changes in their walls associated with surrounding gangrene or inflammation. 3. *Certain conditions of the blood*, viz., hyperinosis or increased tendency in the fibrin to coagulate, such as may be observed in various acute inflammatory affections and pregnancy, probably pyæmia and allied states; and anæmia. *Increased heat* of the blood, either local or general, has been looked upon by Richardson and others as a probable cause of thrombosis. In many instances more than one cause has contributed to the clotting process.

In further considering this subject it will be convenient to treat separately of thrombosis in connection with the *heart*, *pulmonary*, and *systemic vessels*.

CARDIAC THROMBOSIS.—INTRA-CARDIAC BLOOD-CONCRETIONS.—Coagula may form in the heart after death, immediately before this event, or at some previous period more or less remote. These are distinguished from each other by their color, consistence, mode of arrangement with regard to and degreé of adhesion to the cardiac walls, whether they are laminated or not, and whether they have undergone changes, either in the direction of organization or softening. It is desirable to make a few special remarks respecting the *coagulation produced shortly before death*, as this is probably often a very dangerous event, and one which aids materially in bringing about a fatal result. It occurs in connection with organic diseases in the heart, which obstruct the circulation or give rise to roughness of the surface, but is most important in certain acute diseases, where it is due to a condition of the blood favorable to coagulation, combined with a gradual loss of power in the cardiac contractions, in consequence of which the blood is not properly expelled, but is partially whipped up and its fibrin deposited. Obstruction in the lungs frequently contributes to the clotting process. Among the most important diseases in which this is observed are croup, diphtheria, endocarditis, pneumonia, peritonitis, the condition following delivery, erysipelas, rheumatic fever, and pyæmia and its allies. Cardiac thrombosis is much more common, as well as more dangerous in the *right* cavities than the *left*, but may occur on both sides. Usually the clots are decolorized, pale or yellowish, but not uniform throughout, firm and fibrinous, often laminated and fibrillated or granular, entangled among the muscular bands and tendinous cords, somewhat adherent to the surface, but separable without injuring the endocardium. Occasionally they soften in the centre. They may extend a variable distance into the pulmonary artery or aorta, presenting frequently marks of the valves, but these portions can be readily removed.

SYMPTOMS AND SIGNS.—The effects of cardiac thrombosis will vary with the rapidity of its production, its seat and extent; the dangers are that it gives rise to obstruction to the circulation, and interference with the heart's action; that large portions may become detached, and lodged either in one of the main orifices, or in an arterial trunk; or that smaller particles should be separated, and conveyed into the smaller vessels as emboli. Probably also the products of softening of a clot may poison the blood generally. *Sudden extensive clotting* will induce great disturbance of the cardiac action, which becomes irregular and very hurried, the pulse being extremely weak and small, with a tendency to syncope, urgent dyspnœa, intense restlessness and anxiety, followed by signs of obstruction, either in the pulmonary or venous circulation or both, according to the situation of the clot. In less rapid cases the obstructive symptoms are chiefly observed, with more or less cardiac distress. Plugging of an orifice or great vessel by a clot may cause sudden death. The *physical signs* are great irregularity in the rhythm and force of the impulse; increased cardiac dulness, especially towards the right; obscurity and irregularity of the sounds, particularly the first; and alteration in murmurs, or the production of a new murmur, especially *pulmonary systolic.*

TREATMENT.—The remedies required in this condition are absolute rest in the recumbent posture; stimulants, especially if there is a syncopal tendency, with as much liquid nourishment as the patient can take comfortably; heat to the extremities; free dry cupping over the chest. Formerly alkaline bicarbonates were recommended to be freely administered with carbonate of ammonia. Recently Dr. Richardson has advocated the use of liquor ammoniæ (m x in ice water every hour), with iodide of potassium (gr. iii to gr. v every alternate hour), which he has found highly successful. In some instances possibly digitalis might be of use in order to excite stronger contraction of the heart, or gentle galvanism. All lowering measures are injurious, and opiates must be avoided.

THROMBOSIS IN THE PULMONARY ARTERY AND ITS BRANCHES.—Much discussion has been carried on relative to this subject, especially as it applies to women after parturition. Occasionally such persons die suddenly, and after death extensive clots are found in the pulmonary artery and its divisions, which some believe have been the cause of death, and have been formed there primarily and independently; others think that they are the result of embolism, fragments having become detached from clots in the veins or heart, and lodged in the pulmonary vessels as centres for coagulation; while still others regard death as being due to syncope, and the clot to be merely of post-mortem formation. The probability is, that in most instances, at all events, embolism has something to do with the phenomena observed, and it is quite possible that a large mass may be sometimes carried into the pulmonary artery and obstruct it.

Clots may be found only in the main trunk and larger divisions, in the smaller branches, or more or less throughout. According to the extent involved and to the rapidity of coagulation will the clinical phenomena vary. In some instances, as already stated, sudden death is believed to occur, preceded by a cry, in connection with some effort [illegible] after parturition. When only the smaller branches are affected there are no symptoms. If the clotting is more extensive, there is more or less dyspnœa and sense of want of air, with oppression across the chest, evidences of cardiac embarrassment, faintness or actual syncope, much general distress and anxiety, followed by signs of overloading of the right heart and general venous congestion. The symptoms may temporarily subside and then recur. It is highly probable that coagulation in the pulmonary vessels often adds to the danger of various lung and general affections, and prolongs the duration of the former.

Treatment must be similar to that for cardiac thrombosis.

Thrombosis in the Systemic Veins.—Phlegmasia Dolens.—*The* formation of clots in the systemic veins is by no means an uncommon occurrence, resulting from pressure, obstruction, feeble circulation, altered blood, &c., but it is most important in connection with the affection named *phlegmasia dolens*, in which, as a rule, the lower extremity is involved, the external iliac or femoral vein becoming obstructed on one or both sides, or sometimes the common iliac; occasionally the arm is affected. The formation of clots in the venous sinuses of the dura mater is also a very serious matter, which I have observed as the result of injury or disease of the cranial bones.

Phlegmasia is most frequently associated with the puerperal state, coming on at a variable period after delivery, but it may also occur as a sequela of acute febrile diseases, especially typhus and typhoid, pleurisy and pneumonia, and in the advanced stages of various chronic diseases, particularly phthisis and malignant uterine disease. Different views are held as to the pathology of this affection. Some regard *inflammation of the veins* (phlebitis) as the primary lesion after parturition, this having extended from the uterine veins; others consider the plugging to be the first event, due to impure blood or embolism, the emboli frequently coming from thrombi in the pulmonary vessels, and the inflammation to be secondary. Certainly in the cases which have fallen under my observation, where phlegmasia has occurred independently of parturition, coagulation has appeared to be the primary morbid condition, and it has sometimes been brought about by an effort, especially when this was accompanied by temporary interference with the venous circulation in some part.

Anatomical Characters.—A thrombus in a vein varies in its characters according to its age and mode of formation. If a vessel is suddenly plugged, the clot is at first uniform throughout, soft and red; but if th[illegible] is gradually produced, it presents a stratified appearance, and the stra[illegible] may consist of alternate layers of fibrin and white corpuscles. The thrombus increases in extent after its first formation, to a variable degree, this depending chiefly on the force of the circulation, and on the size and situation of the collateral branches. The thrombus undergoes the usual changes in color and consistence, becomes adherent to the vessel, in which it frequently excites inflammation, and *organization* often follows, so that ultimately a fibrous cord alone remains, the vein being obliterated (*adhesive phlebitis*). Occasionally calcification takes place, a "phlebolith" being produced. In some instances partial or complete *softening* or *liquefaction* occurs, beginning in the centre of the clot, and a puriform fluid may result, consisting either of granules and molecules derived from the fibrin, with broken-down corpuscles, or, as some believe, of actual pus, due to proliferation of white corpuscles. This is probably the pathology of so-called *suppurative phlebitis*. In this way the clot may be completely removed, or substances are originated which contaminate and poison the blood.

In *phlegmasia dolens* the smaller veins and lymphatics are also speedily involved, and more or less inflammation is set up often in the skin and subcutaneous tissue, or even in the deeper structures.

Symptoms and Effects.—The symptoms associated with venous thrombosis are those due to: 1. Local irritation by the clot. 2. Obstruction of the vein and consequent interference with the circulation. 3. Detachment of embolic fragments. 4. Constitutional disturbance, which may result from the formation of septic matters and contamination of the blood. In *phlegmasia* pain and tenderness along the veins and lymphatics of the thigh are usually present to a variable degree. One case which came under my notice (after typhus), commenced with a sudden intense pain at the moment of coagulation, which afterwards became most excruciating, deeply situated in the course of the femoral vein, and of an aching and somewhat neuralgic character. In phthisis, also, phlegmasia is often the cause of much distress. The veins are felt in time thickened, and firm or cord-like, and the lymphatics are seen as red lines. Soon there may be signs of venous congestion, but very speedily this is followed by a deadly whiteness of the limb (*white leg*), which swells from below upwards, chiefly from œdema, sometimes attaining an enormous size, and becoming tense, elastic, with a most uncomfortable subjective feeling of tightness. In time the superficial veins become enlarged and varicose if the obstruction is not removed, and the leg often remains swollen for many months, or even permanently, the tissues being thickened and hard. Rigors may occur at the outset, followed by pyrexia and much prostration.

Treatment.—In *phlegmasia dolens* the most efficient treatment is to support the patient well by nourishing food and stimulants; to keep the leg perfectly at rest in a horizontal posture, or even a little raised; to use hot opiate fomentations assiduously, and give sedatives to relieve pain, if required. Subsequently tonics, especially iron and quinine, good diet, and change of air are most beneficial, with douching, frictions, and shampooing of the limb, which must be carefully bandaged, or an elastic stocking be worn. Great improvement may be brought about, even after a long interval.

Thrombosis in the Arteries.—This is almost always associated with a diseased condition of the walls of a vessel, or with embolism. Its symptoms are merely those indicative of local obstruction of arteries.

EMBOLISM.

Origin of Emboli and Anatomical Changes resulting from them.—The following are the principal sources of emboli: 1. Most commonly a thrombus in a *systemic vein*, in the heart, in an artery (especially in connection with aneurism), or, rarely, in the pulmonary vessels. 2. Vegetations about the valves and orifices of the heart, particularly if there is obstructive disease, especially mitral stenosis. 3. Atheroma and calcification of the cardiac valves or of arteries, portions of the morbid materials becoming detached. 4. New growths, *e. g.*, cancer, which have communicated with the interior of vessels. 5. Particles resulting from gangrene of organs. 6. Parasites which have gained access into the vessels. 7. Pigment granules.

According to the size and place of origin of the embolus will be the seat of its arrest. It may be sufficiently large to plug an artery of considerable size, or is only stopped in the capillaries. When originating in the *venous* portion of the circulation emboli rarely pass through the pulmonary capillaries, but become impacted there as a rule; those coming from the pulmonary vessels, the left side of the heart, or the arteries, lodge either in smaller arteries or in the capillaries, and especially in the vessels of the brain, spleen, and kidneys; those from the portal tributaries are generally arrested in the capillaries of the liver. An embolus is chiefly carried in the direction of the main stream, and it is somewhat influenced by gravitation. The seat of impaction is often at a bifurcation, and the closure may be complete, or only partial at first, but a secondary thrombus always forms, so that ultimately the vessel is entirely blocked up to a variable extent. Secondary emboli are sometimes separated from the primary one or the resulting thrombus, and pass on into smaller vessels. Embolism produces irritation in the vessel in which it lodges, and is soon followed by marked hyperæmia in the collateral vessels around, extending over a variable area, which often terminates in their rupture, with the formation of a *hemorrhagic infarct.* In time this either becomes decolorized, more consistent, and organized, or a process of softening and molecular disintegration takes place, beginning in the centre of the infarct, and extending more or less to the circumference, the débris of the involved tissue being evident in the softened mass. Ultimately it may be absorbed, or remain as a caseous, encapsuled mass, or become calcified. The nature of the changes will depend upon the degree to which the circulation is obstructed, and the difficulty in setting up the collateral circulation; the tissue affected; the size of the infarct; and the character of the embolus. If this has septic properties, as when it comes from a gangrenous part, it sets up rapid and violent inflammation, and speedy disorganization occurs, with the production of a puriform material, constituting an *embolic abscess*, which is surrounded by hyperæmia.

The effects of an embolus as regards the part supplied by the vessel which is blocked up, are similar to those of obstruction from any other cause, viz., anæmia, atrophy, softening, fatty degeneration, or actual gangrene.

The most important seats of embolism are the vessels of the lungs, brain, spleen, kidneys, and heart. Petechial spots on the skin, mucous, and serous membranes are sometimes due to this cause. A very interesting case came under my notice, in which sudden embolism occurred in connection with the main vessels of the forearm.

Symptoms.—The clinical phenomena necessarily vary greatly, according to the vessels affected, the rapidity and degree of obstruction, the characters of the embolus, and other circumstances; in a general way it can only be stated that they are those significant of sudden or gradual obstruction of the vessels supplying some organ or part, followed by those indicating the local effects of the embolus, and in some cases by evidences of septicæmia.

CHAPTER XXVII.

DISEASES OF THE ABDOMEN.

PHYSICAL EXAMINATION OF THE ABDOMEN.

Before proceeding to the consideration of the diseases of the abdomen and its contained organs, it is necessary, as in the case of the chest, to point out the various methods of "physical examination" which may be employed, and what information each of them is capable of affording. In order to make this examination satisfactorily, the abdomen should be properly exposed, and the patient placed in an appropriate position. The best posture ordinarily is on the back, with the head and shoulders considerably raised, and the knees and thighs bent, so that the abdominal muscles may be relaxed; however, it is requisite in many cases to make the patient assume other positions, such as lying on either side, or on the face, or kneeling, supported on the hands and knees. The patient should be desired to breathe deeply, or the attention may be occupied with conversation, so that a state of contraction and tension of the muscles may be avoided, which is otherwise very apt to be produced. It only remains to be added, that the examination should be carried out carefully and thoroughly, and that not uncommonly it has to be made on more than one occasion before a satisfactory conclusion can be arrived at.

Assuming that the regions into which the abdomen is artificially divided are known, as well as the anatomy of its contents, I proceed to give an account of the modes of examination which might be required in the investigation of any particular case, though it does not often happen that they are all called for in the same individual. Some of them are similar to those employed in the exploration of chest-affections, though their relative value is very different; others are peculiar to the abdomen.

I. INSPECTION.—By this we ascertain: (i.) *The state of the superficial parts*, viz., the integuments, superficial veins, *umbilicus*. (ii.) The *general shape* and size of the abdomen, as well as any *local* alteration in these respects. (iii.) The extent of the *abdominal respiratory movements*. (iv.) The presence of any *visible pulsation*. (v.) Various *movements*, due either to flatus, or sometimes to fluid when the position of the patient is altered, or to the presence of a fœtus.

II. APPLICATION OF THE HANDS, PALPATION, OR MANIPULATION.—If properly carried out, this becomes one of the most valuable methods of examination in the case of the abdomen, and one which affords most important information; but it requires considerable practice, and has to be varied much in different cases.

Palpation reveals (i.) The condition of the *abdominal walls*, as regards fat, œdema, and the state of the muscles. (ii.) The *shape* and *size* of the abdomen, more accurately than inspection. (iii.) The *sensations* conveyed as regards mobility of the abdomen as a whole, and the degree of resistance, consistence, fluctuation, regularity and smoothness or the reverse, over the surface generally, as well as over its different parts. (iv.) The existence of any *enlarged organ* or *tumor*, with its position and characters. (v.) The *extent* of the *respiratory movements*, both bilateral and unilateral, and their effect upon any tumor which may be present. (vi.) The situation and characters of any pulsation. (vii.) The presence of *friction-fremitus*, produced during the act of breathing. (viii.) Any *movements* set up within the abdomen, such as gurgling from gas in the intestines, or fœtal movements.

III. MENSURATION OR MEASUREMENT.—An ordinary single and double measuring tape of sufficient length are all that is required for measurement, and it affords exact information as to the size of the abdomen and the diaphragmatic respiratory movements. It is particularly valuable as showing the progress of many cases and the effects of treatment. The measurements ordinarily required are—(i.) *Circular* in different parts, but especially a little above and below the umbilicus. (ii.) *Semicircular*, so as to compare the two sides. (iii.) From the *umbilicus* to the *ensiform cartilage*, to the *pubes*, and to the *anterior superior spine of the ilium* on each side.

IV. PERCUSSION.—"Mediate percussion" is usually practiced in the case of the abdomen; a modification of this is employed in the production of what is termed *hydatid fremitus* or *vibration*, which is elicited by applying three fingers of the left hand firmly over certain cystic tumors, and striking the middle finger suddenly with the point of the right middle finger. Another method consists in applying the fingers of one hand over one side of the abdomen, and tapping or filliping the opposite side with those of the other hand, which is the usual plan for producing fluctuation.

The objects of percussion, as regards the abdomen, are: 1. To bring out certain sounds. 2. To realize certain sensations by the fingers, especially resistance, "hydatid fremitus," and fluctuation. The *sounds* elicited may be grouped under the terms *dulness* and *tympanitic sound*, these necessarily varying somewhat in their exact characters. In the normal state they are both met with over different parts of the abdomen, according to the organ which corresponds to the point percussed, and by this mode of examination we are enabled to mark out the exact position and limits of most of the organs in health. The abnormal conditions, as regards sound, which may be met with are: (i.) Excess in the intensity, clearness, or extent of the tympanitic sound. (ii.) Dulness, either too extensive, or in unusual positions. The last is the deviation which requires most attention, and when any abnormal dulness is detected, it is necessary to make out carefully—*a.* Its site, exact limits, and shape; *b.* Whether it differs, according as superficial or deep percussion is made; *c.* If it is influenced by *posture*, *the act of breathing*, *pressure*, or *manipulation*; and in some doubtful cases, it may be requisite to observe the effects upon it of taking food or drink, of the act of vomiting, the use of an enema, or the removal of urine by a catheter. As regards *resistance*, by noticing its degree, an accumulation of fluid may be distinguished from a solid mass, and the actual density of the latter can to a great extent be realized; it is likewise useful in separating flatulent distension of the abdomen from that due to the presence of fluid.

Hydatid fremitus is a peculiar vibrating or trembling sensation, produced in the manner already described, and formerly supposed to be characteristic of hydatid tumors, to which, however, it is not limited, as it can be brought out in connection with any large cyst, having thin and tight walls, and containing a fluid of watery consistence.

Fluctuation indicates the presence of fluid within the cavity of the abdomen, and it is needful to observe the degree of facility of its production, its distinctness, over what part of the abdomen it is felt, and if it is influenced by change of posture; thus information is obtained as to the quantity of fluid, its freedom or limitation by cysts or adhesions, and its consistence. It must be borne in mind that a relaxed or very fat condition of the abdominal walls may cause a sensation simulating fluctuation.

V. AUSCULTATION.—This is not nearly so useful a mode of examination in connection with the abdomen as the chest, and it need scarcely be mentioned that the intervention of a stethoscope is always advisable when practicing it. It generally only gives negative information (except in cases of pregnancy), but sometimes by its aid certain positive signs are detected, viz.: (i.) *Friction-sound* or *grating*, produced during respiration, and due to exudation on the peritoneum, or to roughness of the surface of certain organs. (ii.) *Murmurs* in connection with aneurism, with regard to which it is requisite to notice their site, intensity, extent of conduction, synchronism, pitch, and other characters, as well as any effects produced upon them by pressure or change of position. (iii.) A murmur over the aorta or one of the common iliac arteries, due to pressure, such as that of a tumor. (iv.) *Unusual conduction of the heart-sounds* over the abdomen. (v.) *Sounds* due to the *movement of flatus* in the intestines, or to the *falling of food or liquid into the stomach.* (vi.) *Fluctuation* or *splashing sound*, elicited by shaking the patient, and indicating the presence of air and fluid. (vii.) *Murmurs* and *sounds* heard in pregnancy.

As a rule, the methods of examination thus far considered are sufficient for establishing a diagnosis; but there are others which might be called for in doubtful cases, and from which much aid may be derived. At present it must suffice to enumerate them, as illustrations of their usefulness will be given hereafter.

VI. EXAMINATION DIRECTED TO THE ALIMENTARY CANAL.—This includes: (i.) *The passage of a probang* into the stomach, the end being felt through the abdominal walls, which helps in making out dilatation of this organ. (ii.) *Examination of materials discharged from the stomach*, and it has recently been recommended to make use of the *stomach-pump*, and thus obtain some of the contents at different stages of digestion. (iii.) *The use of purgatives and enemata*, in order to clear out the bowels, which should never be neglected in doubtful cases, the effects being noted; or the injection of a quantity of water or gas per anum. (iv.) *Examination of the anus and per rectum*, by inspection (the speculum being employed if required); by the finger or hand; or the bougie. (v.) *Examination of the stools.*

VII. EXAMINATION PER VAGINAM, as described in obstetric works.

VIII. EXAMINATION OF THE BLADDER AND URINE.—The *use of the catheter* must always be thought of, when there is any reason to suspect an accumulation of urine in the bladder. It may also be requisite to sound this organ. *In all cases it is absolutely necessary to examine the urine carefully.*

L. EXPLORATORY PUNCTURE WITH A SMALL TROCAR.—This is done termine whether fluid is present or not, and its nature.

ADMINISTRATION OF CHLOROFORM.—This may be required in to aid in carrying out other modes of examination, and it at once mines the nature of the so-called "phantom-tumor" of the ab-m.

ysical examination of the abdomen aids chiefly in investigating the wing abnormal conditions: 1. General enlargements. 2. General ation or depression. 3. Local enlargements, or so-called "tumors." minution in the size of organs, and also certain changes in their ical characters, either with or without alteration in dimensions, cirrhosis of the liver. 5. Pulsation, unassociated with any change ape or size. 6. Interference with the abdominal respiratory move-s from various causes.

neral and *local enlargements* in connection with the abdomen are of common occurrence, and, therefore, although this will involve repetition, it may, perhaps, be of service to indicate specially the e of investigation to be pursued, and the points to be observed, in ucting a *physical examination* with the view of arriving at a diag-as to the cause of any such enlargement.

General enlargements. 1. Examine as to the state of the abdominal s, by inspection and palpation, paying particular attention to the acters of the umbilicus. 2. Ascertain the degree of enlargement, its exact form, by inspection, palpation, and measurement. 3. Note xtent of the abdominal respiratory movements by the same methods, whether they give rise to any sensation of fremitus. 4. Manipulate oughly over every part of the abdomen, in order to determine the ations conveyed as to smoothness and regularity, amount of resist-y consistence, gurgling, &c. 5. Observe specially if there is any ation, as well as its seat, extent, and facility of production. 6. ss carefully, noting the sounds elicited over the abdomen in differ-parts, and the sensations conveyed to the fingers during the act. times it is requisite to examine for "hydatid fremitus." 7. Aus-chiefly to ascertain whether any friction-sounds are heard during et of breathing, if there are any of the sounds usually observed in ection with a pregnant uterus; or a pressure-murmur over either artery. 8. Having examined thus far as the patient is lying in the ary position, it is then necessary to observe the effects of various es *of posture*, especially as regards the shape of the abdomen, the ssion-sounds, and any fluctuation which may be present. 9. If this a satisfactory diagnosis cannot be made, it will be requisite ave recourse to the other methods of examination mentioned, par-arly *examination by the rectum* or *vagina*, and the employment of an *exploratory trocar.* Of course the urine should always be thoroughly tested.

II. *Local enlargements.* *Manipulation* is by far the most important mode of examination which can be employed in the investigation of localized abdominal tumors, as may be judged from the following summary, and therefore it is necessary specially to educate the sense of touch for these cases. 1. Any local change in the skin, limited œdema, or enlargement of veins, must be noted. 2. A cursory examination is desirable, in order to determine if there is but one tumor or more, and in the latter case, whether they are separate or connected. The further remarks will apply to each enlargement, should there be more than one. 3. Ascertain the precise situation of the tumor, paying particular attention to the following points: *a.* Whether it extends into the pelvis or not. *b.* If it is median, or occupies one or other side, and to what extent. *c.* If it can be traced within the margin of the thorax, and influences the size of its lower part, or alters the intercostal spaces in any way. *d.* Whether it corresponds to, or can be made out to be part of, either of the organs. *e.* Its depth, whether it lies in the abdominal walls, within the cavity near the surface, or in its deeper part near the spine. 4. Mark out the dimensions and shape as nearly as possible, observing the form of the margin, if this is well or ill-defined, and if the outline corresponds to that of any abdominal organ. 5. Feel carefully over the surface and margins to determine whether they are smooth, granular, nodular, or lobular, noticing the characters of any prominences which may exist, and also the consistence, which may be more or less hard and firm, elastic, doughy, fluctuating, &c. It is important to observe whether the sensations are uniform or not over the enlargement, and if any change is produced by pressure and manipulation, or any gurgling or grating elicited. 6. Ascertain whether the tumor is movable or fixed, as well as the degree of mobility, both by manipulation and under the influence of the respiratory movements. 7. Should there be any pulsation or thrill, the exact characters of each must be noted. 8. Percussion is, of course, most valuable in bringing out sounds and tactile sensations, and in many cases the precise limits and characters of an enlargement can only be made out in this way. It is important to notice whether the results of percussion are uniform over the entire surface or not. 9. Auscultation is sometimes useful, especially to investigate murmurs, which may be produced in the tumor itself, or be the consequence of its pressure upon an artery. 10. The posture must be altered, as in the case of general enlargements, and the effects observed, as regards the site of the tumor, its percussson-sound, or any changes in fluctuation, pulsation, or murmur, should either of these be present. 11. Without again recapitulating the more unusual methods of examination, it may be stated that either or all of them may be called for in doubtful cases, and under any circumstances it is most desirable that the bowels should be thoroughly emptied by the use of purgatives and enemata, as collections of fæces may cause much obscurity, and often simulate tumors of a very serious nature.

CHAPTER XXVIII.

DISEASES OF THE PERITONEUM.

ACUTE PERITONITIS.

ETIOLOGY.—Peritonitis may be divided into certain varieties, according to its mode of causation, viz.: 1. *Traumatic.* This form may arise from mere external injury to the abdomen, penetrating wounds, or rupture by violence of internal organs. It must be remarked, however, that the danger of peritonitis from direct injury has been much exaggerated, as the membrane is often considerably injured in operations, without any particular harm resulting. 2. *Perforative.* The special causes of this important variety of peritonitis will be separately considered. 3. *Irritative.* In not a few instances peritonitis arises from some local irritation, being then either limited, or radiating throughout the sac. Thus it may be associated with diseases of'organs, hernia or intestinal obstruction, ulceration of the bowels, morbid deposits, inflammation and abscess of the lacteal glands, &c., or may be the result of extension from neighboring structures, such as the pleura or pericardium. The source of irritation may be very obscure, requiring careful searching after. 4. *Secondary,* from *blood-poisoning.* Peritonitis from this cause is especially important in connection with the *puerperal state* and *Bright's disease.* It may also be met with in the course of small-pox, typhoid, pyæmia, erysipelas, glanders, gout, rheumatic fever, &c. In some of these cases it is supposed to be *metastatic.* 5. *Idiopathic.* Under this head are included those cases which cannot be traced to either class of causes previously mentioned, but are supposed to be due to cold, overeating, or drinking, and other injurious influences.

Many doubt the existence of this variety, but a few cases have come under my notice, which certainly seemed to come fairly under this class. 6. *Puerperal peritonitis* is believed by some observers to be *infectious.*

But little can be said as to *predisposing causes.* Children are only very rarely attacked with acute general peritonitis, and in them it usually is associated with some exanthematous fever. Certain forms of blood-poisoning, but especially that connected with renal disease, are very favorable to peritonitis from any slight irritation. *Puerperal peritonitis* may occur in an epidemic form.

ANATOMICAL CHARACTERS.—These being in the main similar to those observed in other serous inflammations, it is only necessary to point out certain special features in the morbid anatomy of peritonitis, which seem worthy of notice. The vascularization is often very intense, and is most marked where the coils of intestines touch. The subserous tissue, and also the muscular coat of the alimentary canal, are usually much sodden, infiltrated, and softened. The lymph, though not uncommonly tolerably firm, matting together the coils of intestines, yet seems to be more frequently of a soft, non-organizable nature than in other serous inflammations, and flakes of it are always detached in abundance, or even gelatinous-looking masses of considerable size. In some instances it has a greasy aspect. The effusion is, as a rule, comparatively small in quantity, and the explanation of this may be, that the intestines are generally so distended with gas, that they prevent much accumulation of fluid. This is always more or less flaky and turbid, and not uncommonly has an almost purulent appearance, occasionally being actually purulent, especially in puerperal and other low forms of peritonitis. Sometimes it is mixed with blood. Much fetid gas is frequently present in the peritoneal sac, and, in certain cases, foreign materials. *Gangrene* is occasionally observed. The morbid products of peritonitis are in some instances of the most virulently septic character, and the introduction of the smallest quantity into the system is highly dangerous; hence special care should always be taken in conducting a post-mortem examination in these cases.

According to the extent of the inflammation, peritonitis is named *general* or *local,* the former term merely indicating that it

ve, for the entire surface is but rarely involved. The
eties are named according to the part affected, such as
hepatic, omental, nephritic, &c.

recovery take place, thickenings, agglutinations, and
adhesion form, which afterwards may prove highly in-

OMS.—Peritonitis presents considerable variations in its
istory, but it will be convenient first to consider a typical
then point out the principal forms which call for special

et of the disease is usually definite and marked, being
with distinct, often severe and repeated rigors. These
ollowed, sometimes accompanied, or rarely even preceded
ymptoms, referable to the abdomen and its contents,
ences of pure constitutional disturbance. Some of the
ptoms are due to the irritation of organs caused by the
peritoneum, or paralysis of the muscular coat of the
scera, especially the stomach and bowels.

ver the abdomen is, as a rule, a prominent symptom.
r begins at one part, especially below, but may ultimately
ver the entire surface, though it frequently is more
n one region. Its intensity and characters vary much,
enerally very severe, sometimes agonizing, hot, burning,
or darting in character. Any disturbance of the parts
it considerably, as by movement of the body, a deep
ughing, vomiting, defecation, or even the movement of
the intestines. There is extreme tenderness, especially
g deep and limited pressure, but in some cases even the
s cannot be borne. The alimentary canal is gravely
s evidenced by a *very small, irritable, red tongue,* slightly
nding to dryness; complete loss of appetite, with great
sea and *vomiting* of everything swallowed; and *absolute*
n.

pearance of the patient is often highly characteristic.
pale or flushed, presents an expression of evident suffer-
grave constitutional disorder, combined with anxiety,
es being drawn and pinched. There is much prostra-
h general uneasiness and restlessness, but though the

arms may be thrown about, the patient keeps the body perfectly still, on account of the pain which movement causes, and instinctively assumes a characteristic posture, with the view of relaxing the abdominal muscles, viz., *lying on the back, with the head and shoulders raised, and the knees drawn up.*

Pyrexia is, as a rule, but *not always*, present to a very marked degree, while there is no regularity in the temperature. The *pulse* is increased in frequency, ranging from 100 to 150 or more, *small, sharp*, often *hard and wiry*, or *thready;* in bad cases it tends to become extremely frequent, feeble, and irregular. The *blood* is often highly hyperinotic. *Respiration* is hurried, but shallow; persistent hiccup causes much distress in some cases. The *urine* is markedly febrile, and not uncommonly contains albumen. It may be almost suppressed, or retained. Micturition is sometimes very frequent. As a rule, no particular cerebral symptoms are observed, except headache and sleeplessness; in bad cases, however, low delirium may set in, or, in puerperal peritonitis, this is sometimes of a wild type.

Physical examination of the abdomen reveals some important signs, viz.: 1. Tympanitic distension, often extreme. 2. Absolute cessation of all abdominal respiratory movements. 3. Occasionally friction-fremitus or sound, due to lymph, especially over the liver, if the patient can be made to breathe deeply. 4. Usually evidences of the presence of a certain amount of fluid, there being dulness in dependent parts, with, in some instances, a sense of fluctuation, movable with change of posture.

When peritonitis tends towards a fatal issue, the patient becomes extremely prostrate and collapsed, as indicated by the features, by cold, clammy sweats, coldness of the extremities, and an extremely rapid, feeble, and irregular pulse. The pain in the abdomen often ceases, sometimes suddenly, and the tympanitis may disappear. Sometimes large quantities of a dark fluid, containing altered blood, are expelled from the stomach and bowels without any effort. Low nervous symptoms usually set in, but the intellect may be clear almost to the last. Occasionally death seems to result from asphyxia or coma. Should recovery take place, there is a gradual subsidence of the symptoms, and among the chief signs of improvement are a change in the expression, increase in the force and fulness of the pulse, and a better sphygmographic tracing, relief of constipation, and increase in the quantity of urine. Peritonitis is said to terminate occasionally by *crisis*, with critical discharges, but this rarely happens.

The special forms of peritonitis requiring notice are as follows; 1. *Perforative*, which will be separately considered. 2. *Latent.* Cases are sometimes observed in which there is extensive peritonitis without any symptoms, or none of any definite character. This may be due to the mental condition of the patient, but not always. A remarkable illustration of this variety came under my care recently at University Hospital, in which there were absolutely no signs of peritonitis, and yet this was the only lesion found after death. 3. *Adynamic.* Here there is a rapid tendency towards the "typhoid" condition, with a dry and brown tongue, sordes on the teeth, and low nervous symptoms. 4. *Erysipelatous.* Puerperal peritonitis is the best illustration of this form, in which the inflammation is very extensive, intense, and rapid in its progress, the products being remarkably non-plastic, consisting chiefly of a purulent-looking fluid, often very abundant. The symptoms are proportionately severe, and of a low type. It is also observed after low fevers sometimes, and in pyæmia. 5. *Local.* When peritonitis is limited to some particular organ, or more marked over it, the pain may be localized, and symptoms connected with this special organ are prominent. When the parietal peritoneum or great omentum is involved, there is severe superficial pain, with tenderness. 6. The symptoms of peritonitis may be modified by *complications.* Of these the most important is *enteritis*, which may give rise to diarrhœa instead of constipation.

DIAGNOSIS.—It is important to bear in mind the possibility of peritonitis being latent, should there be any condition present likely to originate it. The principal affections from which it has to be distinguished are cramp or colic; muscular rheumatism of the abdominal walls; enteritis; enteralgia and other neuralgic pains within the abdomen; the passage of a gallstone; and certain cases of hysteria, in which there is tympanitis, with other local symptoms, closely simulating peritonitis. The diagnosis is founded on: 1. The history of the case, as to the exciting cause and mode of onset. 2. *The aspect of the patient*, which usually suggests grave constitutional disturbance in peritonitis, while there is n evidence of hysteria. 3. The *posture* of the patient, and state o *absolute rest as regards the body.* 4. Local symptoms, especiall the severity and characters of the pain; marked tenderness, whic is *not merely superficial* but also *deep;* vomiting and constipatio 5. *Physical* signs, as evidencing great tympanitis, with some flui and possibly the presence of lymph. 6. The existence of mor or less pyrexia, often with *special characters* of the *pulse, tongu* and *urine.*

PROGNOSIS.—Peritonitis is always a highly dangerous affection, but its gravity differs materially according to its cause. Perforative peritonitis is extremely fatal, and next in order come puerperal, and those cases associated with pyæmia and other forms of blood-poisoning. Traumatic and local varieties are much less serious. Low symptoms are unfavorable, and the condition of the pulse, especially as revealed by the sphygmograph, will help the prognosis. The duration of fatal cases may vary from 24 or 48 hours to 3 or 4 weeks: they do not often extend beyond a week.

TREATMENT.—It is quite useless attempting to lay down any exact rules of treatment for peritonitis, as this has to be so materially modified in different cases, and it will be only practicable to indicate the general principles which are to be followed, and the main remedies for carrying them out, It must be premised that any cause which is setting up or increasing peritonitis must be at once removed, if possible, and should be carefully sought for in doubtful cases, as for instance an intestinal hernia, which must be reduced or operated upon. The main principles are: 1. To procure rest for the affected parts. 2. To subdue the inflammation, and aid in the removal of its products. 3. To sustain th strength of the patient. 4. To treat various symptoms.

The *removal of blood* by venesection, or by the application a large number of leeches over the abdomen, is a measure whi has received particular favor in peritonitis, and certainly it see to be more serviceable here than in other serous inflammatio but at the same time there are very many cases for which ble ing is by no means suitable, and all the merits of a case mu considered before having recourse to this treatment. It is extensive peritonitis occurs in a healthy, strong, and ple subject, that withdrawal of blood is indicated, and then only in the early stages of its progress; when it is associated with blood-poisoning, or a low condition of the system; if the patient is weak, either constitutionally, or from any pre-existing illness; or if the inflammatory process is far advanced, it is decidedly injurious to take away any blood. The balance of evidence is opposed to bleeding in puerperal peritonitis. The application of leeches seems to be much preferable to venesection, the number employed varying from 10 to 20, 30, or even more, in appropriate cases. *Mercurialization*, by means of calomel administered with opium, is another very common mode of treatment, but it appears to me to be as useless or injurious in this as in other serous inflammations.

Opium is a remedy of the utmost importance. It not only relieves symptoms, especially pain and vomiting, but also prevents the peristaltic action of the bowels, and thus contributes greatly to the maintenance of *rest*. It is best given in the form of pill, containing ½ grain to 2 grains, and repeated every two, three, or four hours, according to circumstances. Of course if Bright's disease is present, it can only be employed very cautiously. *Morphia*, either administered as a pill, containing ¼ to ½ grain, or by subcutaneous injection, is also highly valuable in some cases. Where the stomach is extremely irritable tincture of opium may be introduced by enema. Other anodynes may be given when opium is inadmissible. *Quinine* in full doses has been recommended, and in low forms of peritonitis it might probably be used with much advantage, along with opium.

The diet requires the most careful attention. Only liquids should be given, cool or even cold, and they must be administered in small and definite quantities, at stated intervals. Frequently abundant nutriment is required, especially milk, and well-made beef tea. In many instances also alcoholic stimulants are needed, and in low cases these are the only remedies on which reliance can be placed. The sucking of ice is highly to be commended; or small quantities of iced drinks might be given. In many cases it is requisite to have recourse to the administration of nutriment by enemata, especially when the stomach is very irritable.

Local applications over the abdomen are of decided value. The best are *hot* linseed-meal poultices, not too heavy, sprinkled over with laudanum, and changed frequently. Warm anodyne or turpentine fomentations are also useful (for applying which spongio-piline is of service), as well as sinapisms. Some recommend the employment of cold compresses, frequently changed. In the more advanced stages, a blister may be beneficial in some cases. It is often desirable to employ an apparatus which will keep off the weight of the bedclothes from the abdomen.

The chief symptoms requiring attention are pain, vomiting, tympanitis, constipation or diarrhœa, urgent dyspnœa, and those indicative of adynamia. The remedies already considered will assist in relieving most of these. Small quantities of effervescents, with hydrocyanic acid and morphia; soda-water and milk; the sucking of lumps of ice; or creasote, may diminish the sickness. Tympanitis is best relieved by enemata of turpentine, or the passage of a long tube per rectum. Some recommend puncture of the colon with a minute trocar, and this may be had recourse to in extreme cases, if other measures fail. With regard to constipation, in some instances it is desirable to endeavor to clear out the bowels at first by a full dose of calomel, and afterwards to employ enemata; but when there is perforation, *on no account must the bowels be disturbed.* Diarrhœa is best treated by enemata of opium. Dyspnœa is usually relieved by removing the tympanitis. Adynamic symptoms require ammonia and bark or turpentine internally, along with free stimulation and support.

CHRONIC PERITONITIS.

ETIOLOGY.—Chronic peritonitis is observed: 1. As the remains of one or more acute attacks. 2. After repeated paracentesis for ascites. 3. In connection with chronic diseases of organs, such as cirrhosis or cancer of the liver, chronic ulcer of the stomach or intestines. 4. Associated with some diathesis, especially when *cancer* or *tubercle* is deposited in the peritoneum, but also in Bright's disease, and possibly rheumatism.

ANATOMICAL CHARACTERS.—These necessarily vary greatly, but in a general way they may be said to be, thickening of the peritoneum, sometimes to an extreme degree; adhesions in the form of bands or extensive matting together of the organs; accumulation of more or less fluid, ranging from mere serum to actual pus, or containing blood, and often confined in loculi limited by the adhesions. In some cases large masses of organized lymph are seen, and much pigment is often present. Caseous degeneration may have taken place in parts, or deposits of cancer or tubercle may be evident.

SYMPTOMS.—In some cases there are no clinical evidences of chronic peritonitis, or only such as are very obscure; in others, merely physical signs are observed. When present, the symptoms are various subjective sensations in the abdomen; disturbance of the alimentary canal; sometimes evidences of pressure; with as a rule, more or less constitutional disorder. Uneasiness, or more or less actual pain is experienced, never severe, liable to come and go, often colicky, and increased by shaking the body. Sometimes there is a sense of soreness or heat. Tenderness is common, being frequently more marked in particular spots. The digestive organs are generally disturbed, but it is often difficult to say how far this is due to the peritonitis. This does, however, tend to produce constipation, and the bands of adhesion may lead to absolute intestinal obstruction. In *tubercular peritonitis* diarrhœa is common, owing to intestinal ulceration. Occasionally jaundice, ascites, or anasarca of the legs occurs, as the result of pressure on the common duct or veins. More or less emaciation, with a dry and harsh skin, occasional pyrexia, tendency to hectic, and other symptoms indicate constitutional disturbance, but it is probable that these are, as a rule, chiefly due to the condition with which the peritonitis is associated.

Physical examination often yields important information. 1. The abdomen is enlarged, and this may be the first thing which has attracted the patient's attention. The enlargement is never very great, usually regular, but not always quite so. 2. The sensations are seldom uniform over the entire surface. Fluctuation may be detected in parts, but only indistinctly, and it is often very limited, or in unusual situations, owing to the fluid being inclosed in locular spaces. In other regions there may be a more solid feel, or even tumors may be detected sometimes. The abdomen may be movable as a whole. 3. Dulness is frequently very extensive, owing to the arrangement of the fluid, and may be chiefly in front. In some instances tympanitic and dull sounds are heard over contiguous and irregular spots. There may be a sense of much resistance. 4. Friction-fremitus and sound can sometimes be detected. 5. Change of posture frequently does not produce much effect, on account of the fluid being "loculated."

TREATMENT.—The main indication in most cases is to treat the constitutional state by means of cod-liver oil, tonics, mild ferruginous preparations, light nutritious diet, an appropriate climate, &c. For the peritonitis, iodide of potassium or iodide of iron may be tried internally, with local counter-irritation over the abdomen, especially by iodine liniment or ointment. This part should be covered with cotton-wool, and well bandaged. I have known considerable benefit follow in simple cases, from systematic pressure by bandaging the abdomen. Pain and constipation must be relieved by the usual means, but caution must be exercised in giving opium, and also in administering strong purgatives. Hot-air or vapor baths are useful, if there is much fluid.

MORBID GROWTHS IN THE PERITONEUM.

The most important of these are *tubercle* and *cancer*. *Hydatids* are occasionally found, and very rarely other tumors. The folds of the peritoneum, especially the omentum, frequently inclose a great quantity of fat.

Tubercle occurs in the peritoneum, either over limited patches corresponding to intestinal ulcers; as a part of acute miliary tuberculosis; or extensively, secondary to tubercle in other parts.

Cancer is met with in the form of scirrhus, encephaloid, or colloid, the omentum being a comparatively frequent seat of the last-mentioned. Usually the peritoneum is involved secondarily by extension from one of the organs, but in rare instances it is affected primarily and solely.

These morbid growths tend to produce ascites or chronic peritonitis, and it is to these conditions that their local symptoms are mainly due. Sometimes fluid collects with extreme rapidity in cancer. It is desirable to make a few additional remarks with regard to colloid in the omentum, especially as regards its physical signs. 1. The enlargement may be very great, but wanting in uniformity; the umbilicus appears stretched, but not everted. 2. Firm, irregular masses can generally be felt, and even if fluid is present, fluctuation is very indistinct. 3. Dulness is usually present over the front of the abdomen. 4. Change of posture produces no effect, unless there is much fluid present. 5. The exploratory trocar may bring away a slimy gelatinous fluid, and this is occasionally discharged by vomiting or per rectum.

ABDOMINAL PERFORATIONS AND RUPTURES.

Apart from the effects of traumatic injury, perforations and ruptures are liable to take place in connection with the abdominal contents, and in order to avoid repetition, it will be convenient to indicate the chief facts pertaining to this subject in the present chapter, as the peritoneum so commonly suffers in these cases.

ETIOLOGY AND PATHOLOGY.—The principal structures which are liable to give way, and the pathological causes which bring about this result, may be thus stated. 1. Perforation of the stomach or intestines *from within*, due to ulceration or the resulting cicatrices; gangrene; cancer; the action of corrosive poisons (especially on the stomach); or bodies causing mechanical irritation and destruction, particularly foreign bodies introduced from without, but sometimes merely hardened fæces, worms, or gallstones. The last are very important in connection with the *appendix vermiformis*, into which fruit-stones and other substances are liable to pass, setting up violent inflammation, and leading to ultimate perforation. It must be mentioned that in the stomach extensive post-mortem softening and destruction of coats may occur under certain circumstances, owing to the action of the gastric juice. 2. Rupture of an abscess or hydatid cyst in the liver. 3. Perforation of the gall-bladder, by gallstones after ulceration, or from cancer. 4. Rupture of the spleen, from extreme enlargement and softening, or abscess. 5. Various ruptures in connection with the uterus and ovaries. 6. Bursting of any accumulation in the pelvis of the kidney, of an abscess or cyst in this organ, or of the bladder from overdistension. 7. Bursting of an abscess, unconnected with any organ, or of a soft morbid accumulation in the glands. 8. Rupture of an aneurism. 9. Perforation of a hollow viscus *from without*, owing to the destruction of its coats by some solid tumor. 10. Bursting of a peritoneal accumulation. 11. It must be mentioned that very rarely some fluid collection in the chest opens into the abdominal cavity.

These lesions usually occur without any immediate *exciting cause*, but some of them may be brought on by some mechanical disturbance, such as vomiting, coughing, laughing, straining at stool, or *in the case of ulceration of the alimentary canal, by taking excess of or irritating articles of food, or such as cause flatulent distension.*

The perforation or rupture may take place into different parts, and the pathological and clinical results will vary accordingly. 1. Most frequently the opening communicates with the peritoneum, into which foreign matters are poured more or less freely, producing *perforative peritonitis*, severe and rapid in proportion to the quantity and irritant nature of the materials thus introduced into the sac. 2. Sometimes the *subperitoneal cellular tissue* is the structure affected, local inflammation and abscesses being produced there. 3. Not uncommonly one hollow organ forms an adhesion with another, and when perforation occurs, a communication is set up between them ; or the adhesion may be with a solid organ, and when perforation is completed, this may make up for the deficiency. 4. Union may be set up with the abdominal wall, and the opening be consequently on the external surface.

SYMPTOMS.—From the facts just stated it will be evident that the symptoms indicating perforation must differ considerably, and there may be none at all, or death may be almost instantaneous, as from rupture of an aneurism. As a rule, there have been previous evidences of the morbid condition in connection with which the lesion occurs. Presuming it to be sudden and of any extent, and to take place into the cavity of the abdomen, this is usually indicated by a *sudden, intense pain* at the seat of rupture, often of a burning character, which spreads rapidly over the abdomen, being sometimes attended with a feeling of something pouring out; at the same time there are the ordinary signs of more or less collapse and shock, and death may take place rapidly from this cause. Should the patient rally, peritonitis will be set up speedily, the peculiar features of which are, that the local symptoms precede any rigors; that the pain starts from a certain spot; that the course is usually very rapid and the termination almost always fatal. If the perforation takes place into the cellular tissue, there will be evidences of local inflammation, followed by abscess, with general pyrexia. The attacks of pain and collapse may be repeated, indicating probably extension of the perforation, or fresh openings.

TREATMENT.—In any case of perforation the patient must be kept *absolutely at rest*, and this applies emphatically to the organ which has given way. In the case of the stomach or bowels, there should be complete abstinence from food by the mouth, and only small enemata administered. *Opium* is the great remedy, counteracting shock, relieving pain, and stopping peristaltic action. It should be given in full doses, at short intervals. Collapse must also be treated by free administration of stimulants (which, if the alimentary canal is affected, must be given by enemata), heat to the extremities, sinapisms, &c. Hot fomentations may be applied over the abdomen. Should peritonitis or other inflammation be set up, the usual treatment must be adopted. With respect to the stomach and intestines, it is extremely important to *avoid giving things by the mouth for some time*, should either of these be affected, and to *refrain from any attempt to act upon the bowels by aperients.*

ASCITES.—DROPSY OF THE PERITONEUM.

ETIOLOGY.—Ascites is merely a localized dropsy of the peritoneum, and, excluding the effects of peritonitis, it may be the result of: 1. Pressure upon the branches of the portal vein *within the liver* especially from *cirrhosis* and other forms of chronic contraction of the liver, or infiltrated cancer. 2. Pressure upon the portal trunk in the fissure *outside the liver.* It is from this cause that ascites is most frequently associated with many diseases of the liver, such as cancer, albuminoid disease, hydatids, or abscess, either projections from the liver pressing on the vein, or the glands in the fissure being affected. Inflammatory thickening from perihepatitis, any tumor in the vicinity, or aneurism, may also produce pressure. 3. Internal obstruction of the portal vein by a thrombus. 4. Pressure upon the *inferior vena cava*, after it receives the hepatic trunk. 5. Cardiac diseases obstructing the venous circulation, these in time giving rise to organic changes in the liver. 6. Renal disease. 7. Morbid deposits in the peritoneum, which are supposed to act by inducing active congestion, but which probably chiefly originate dropsy by pressure upon the small vessels. 8. Exposure to cold, suppression of discharges, or chronic skin diseases, and other causes, which may lead to internal active congestion. The reality of this class of causes is questionable, but cases of ascites have been attributed to them.

ANATOMICAL CHARACTERS.—The quantity of dropsical fluid which may collect in the peritoneum varies extremely, often amounting to several gallons; it distends and macerates the tissues in proportion to its amount. In characters it is usually in the main watery in consistence, clear and transparent, colorless or faintly yellow, alkaline in reaction. It may be turbid, dirty-looking, or stained by bile or blood, gelatinous, or containing soft fibrinous masses. Its composition is far from being uniform, but generally there is much albumen in it; it yields fibrin, urea, or cholesterin occasionally, and may be neutral or even acid in reaction in rare instances.

SYMPTOMS.—The only symptoms directly due to ascites are those dependent upon the mechanical effects of the fluid. There is more or less discomfort and sense of fulness, in proportion to its quantity. Digestive disturbances are usually present, flatulence and constipation being prominent symptoms: sometimes vomiting occurs. From the interference with the diaphragm, dyspnœa is complained of and may be urgent, being much increased often by flatulence. The heart's action may also be disturbed, as evidenced by palpitation, irregularity, or sometimes a tendency to syncope. Anasarca of the legs frequently follows ascites, owing to pressure by the fluid on the vena cava, which also leads to enlargement of the veins of the abdominal wall. If the ascites is caused by pressure on the vena cava, of course anasarca of the legs is observed simultaneously, or before it. Albuminuria may be induced by pressure on the renal veins.

PHYSICAL SIGNS.—These require careful consideration, and in the majority of cases they are sufficiently characteristic, but they necessarily depend upon the quantity of fluid present. 1. The skin usually appears stretched to a variable degree, smooth, and shining, feeling thin; the superficial veins are often enlarged, and the umbilicus is stretched, *everted*, or *pouched out*, and finally *obliterated*. 2. The abdomen is more or less enlarged, in some cases enormously, quite symmetrical, and of a rounded form, though it tends to bulge in the flanks, or in the hypogastric and iliac regions, according to the position of the patient; the greatest circumference is about the level of the umbilicus, which is the highest point of the abdomen; the thorax appears small and depressed, and its lower margin may be everted, or the ensiform cartilage bent sharply up. Usually a history can be obtained, that the enlargement commenced below, and that it increased steadily, though slowly, as a rule. 3. Abdominal respiratory movements are either deficient or absent. 4. The surface feels quite regular and uniform, and fluctuation is, as a rule, readily induced from side to side. 5. Dulness is observed first towards the lumbar regions, if the patient lies in the supine position, then in the lower part of the abdomen, and it extends by degrees *towards the front and upwards*, until finally it may be observed all over the abdomen. *The umbilical region retains the tympanitic sound longest*, and it is often excessive here. When the patient sits up, the prominence between the recti is tympanitic. 6. Auscultation is negative. 7. Change of posture gives important signs, viz., the fluid can occasionally be seen moving; the form of the abdomen is altered, bulging being observed in the most dependent part; while the seat of dulness and fluctuation is changed. 8. Examination per rectum gives the sensation of the resistance of fluid. 9. Examination per vaginam reveals that the vagina is short, and the uterus pushed down or flexed. 10. The fluid removed by the trocar is usually serum, containing generally a considerable amount of albumen. 11. The heart is often displaced upwards and to the left, and occasionally a basic murmur is thus produced.

DIAGNOSIS.—There are two points in the diagnosis of ascites, viz., 1st, to determine whether fluid is present, and to distinguish the enlargement thus produced from that dependent upon other morbid conditions: 2d, to make out its cause. The chief general abdominal enlargements which may simulate ascites are those due to great obesity, with much fat in the omentum; a flabby, relaxed state of the walls, with flatulence; considerable subcutaneous œdema; peritonitis, especially chronic; colloid in the omentum; greatly dilated stomach; ovarian tumor; distension of the uterus with fluid, or pregnancy; extremely distended bladder; a large hydatid tumor, in connection with the liver or any other structure; an enormous cyst in the kidney; a phantom tumor.

It is by *physical examination* that ascites is mainly distinguished from these, but it is important to observe that its ordinary signs may be modified or obscured by some of the above-mentioned conditions; by its association with a tumor, morbid deposit, or enlarged organ; by the fluid being either very small in quantity, or, on the other hand, extremely abundant; by the mesentery being so short as not to allow the intestines to come forward; and by the existence of adhesions limiting the fluid. When ascites is associated with any solid enlargement, the latter may frequently be recognized by making sudden firm pressure with the fingers, by which the fluid is pushed aside, and the firm mass reached; or, in doubtful cases, the fluid can be removed, and satisfactory examination then carried out.

Important aid in the diagnosis may also be derived from: 1. A careful general history of the case, and the condition of the patient as to age, general appearance, &c. 2. The history of the enlargement as to whether it has been acute or chronic, with its rate of increase, and whether it has fluctuated or steadily progressed; as well as its seat of origin and direction of growth. 3. The other symptoms present, and the condition of the main organs, which should all be thoroughly examined. 4. The results of treatment, not forgetting the use of the trocar, of the catheter, and of means for clearing out the alimentary canal.

It would occupy far too much space to enter upon the individual diagnosis of each of the enlargements mentioned. The characters of most of them are described in other parts of this work, to which descriptions reference must be made. It is desirable, however, to consider specially the characters by which *cystic tumor of the ovary* is distinguished from *ascites*. 1. *Physical signs.* (i.) The umbilicus is often thinned and flattened out, but not everted or pouched out. (ii.) The enlargement is not so globular in shape, projects anteriorly, does not bulge in dependent parts, and is frequently not quite symmetrical, which is accurately determined by semicircular measurements, or comparing the distance from the umbilicus to the anterior superior iliac spine on each side. The greatest circumference is said to be about an inch below the umbilicus, in the recumbent posture; and the measurement from the ensiform cartilage to the umbilicus is generally shortened. (iii.) As a rule fluctuation is indistinct, and the enlargement feels more or less firm and resistant, or even nodulated, while the sensations are not uniform over the entire surface. Frequently, on deep pressure, greater resistance or tension is felt on one side than the other. (iv) Percussion reveals dulness chiefly *in front* of the abdomen, even in the umbilical region, while the flanks are tympanitic, and it often extends more towards one side than the other. The prominence between the recti in the sitting posture is dull. There is usually a sense of considerable resistance on percussion. (v.) Auscultation may detect a pressure-murmur in *one iliac artery.* (vi.) Change of posture does not produce the alterations observed in ascites. (vii.) Examination per rectum detects a firm, resistant substance. (viii.) The vagina is long and narrow above, the uterus being raised. (ix.) An exploratory trocar may bring away a thick, glutinous, or colored fluid, which sometimes contains cholesterin, and after this has been removed, solid portions of the tumor may be felt more readily. 2. There is no history of any cause, or evidence of organic disease, likely to produce ascites. 3. Frequently the patient has observed that the enlargement has commenced below, and *from one side.* 4. Symptoms are absent, such as are often observed along with ascites, while anasarca of the legs is commonly an early symptom, which may be entirely or chiefly *on one side*, from pressure on the veins.

With regard to the diagnosis of the *cause* of ascites, this can generally be made out by satisfactory examination as regards history, symptoms, and physical signs, directed to the liver, heart, and kidneys; the distinctive characters as regards the dropsy itself are pointed out in the chapter which treats of this symptom in general. Obscure causes can only be determined by exclusion, and by a thorough consideration of all the features of the individual case.

TREATMENT.—In addition to the ordinary measures adopted in the treatment of dropsy, there are two which demand special notice, viz., *paracentesis* and the employment of *pressure.* It has been the custom to look upon paracentesis as an operation which should only be performed as a last resource, when the fluid has collected to such a degree as to cause urgent symptoms. When the ascites is a part of general dropsy from cardiac or renal disease, the amount of fluid is not often so great as to need its removal by operation, nor could this serve any good purpose, except in affording temporary relief. The last remark applies also to many cases where it is a merely local dropsy; but there is one class of cases in which paracentesis may be performed as a *curative* measure, so far as the ascites is concerned, viz., when it is dependent upon *cirrhosis of the liver.* In such cases I have for some time had recourse to *repeated paracentesis* as a systematic method of treatment, the fluid being taken away again and again should it reaccumulate, and the results have been most satisfactory, due care being of course exercised in the performance of the operation, and in the subsequent management of the case. In a recent number of the *Practitioner* I have published some observations on this subject, and since then other cases have been under my care, in which this treatment has been very successful. Other observers have also recorded favorable results from this operation, and therefore it appears to me justifiable to insist upon the employment of *paracentesis abdominis* as a *means of cure* in connection with *ascites* from *uncomplicated cirrhosis of the liver.* I am aware that cases have been recorded in which recovery has followed merely general tonic and other modes of treatment, but this is such a rare event, that sole reliance cannot be placed on these remedies, though they aid materially the treatment by operation. This may also be assisted by *pressure,* the abdomen being tightly bound by a broad roller, as soon as all danger of undue irritation has ceased, from which much benefit often results. I may state that never has any injurious consequence followed the operation within my experience, and in some almost hopeless cases permanent recovery has been brought about. The employment of poultices of digitalis leaves, along with pressure, has appeared to do good in some instances.

CHAPTER XXIX.

DISEASES OF THE STOMACH AND INTESTINES.

Clinical Characters.—Symptoms referable to the alimentary canal are of such common occurrence, that it has rightly become a matter of routine in the examination of a patient, to make inquiry concerning them. In the succeeding remarks a general sketch will first be given of the various derangements which are met with, and of the course of clinical investigation to be pursued, and afterwards some of the symptoms will be considered more fully.

1. ***Morbid Sensations*** are very commonly present over some part of the abdomen, the principal being pain and tenderness; heat or burning in the epigastrium; sinking, dragging, or tightness; discomfort, weight, and fulness after food, or, on the other hand, a feeling of emptiness even after a full meal, with constant craving for food; abnormal movements within the abdomen. *Cardialgia* or *heartburn* are terms applied to a peculiar sensation of heat or burning in the epigastrium, and extending upwards, as if along the œsophagus, to the throat; or in some cases spreading more or less over the chest. With regard to pain, it is very

important not only to investigate it carefully in all the usual particulars, but also in many cases to ascertain whether, and in what way, it is influenced by food or drink in general, or by special articles of diet; by vomiting or eructation; defecation or the passage of flatus; posture or movement; coughing or deep inspiration; mental disturbance; or, in certain instances, by the periods of menstruation. In determining whether there is tenderness, it is well to take off the patient's attention, and its site and extent, degree, and apparent depth must be made out as accurately as possible, while it must be noted whether it is connected with any evident morbid condition, such as a tumor. These remarks apply to all kinds of abdominal pain or tenderness. When the stomach is affected, uncomfortable or painful sensations are often referred to the back, between the shoulders.

2. The sensations as regards *inclination for food* and *drink* are often altered. *Appetite* may be deficient or lost (*anorexia*), in some cases the feeling amounting to a complete disgust for food; excessive, both as to quantity and frequency (*bulimia*); attended with a desire or dislike for special articles; or altogether depraved. *Thirst* is a frequent symptom, and there may be a particular inclination for certain drinks; on the other hand, an antipathy to fluids is sometimes observed.

3. The *process of digestion* is frequently interfered with. Hence decomposition or fermentation is set up in the contents of the alimentary canal, leading to the production of gases, occasionally alcohol, various acids (lactic,butyric, acetic, &c.), or vegetable growths (*sarcinæ ventriculi* and *torulæ*). Great discomfort may thus arise from flatulent distension, gurgling (borborygmi), acidity, &c.

4. Acts are excited in connection with the stomach with the view of expelling offending materials, viz., *vomiting* and *retching*, which may or may not be attended with a feeling of *nausea; regurgitation* of food, or *eructation* of gases, liquids and other substances. With regard to the mechanism of these acts, vomiting is not only attended with contraction of the muscular coat of the stomach, but also of the abdominal and thoracic muscles, while the cardiac end of the œsophagus is relaxed; retching is the same act, but ineffectual, only air being expelled, either because the stomach is empty, or because the lower portion of the œsophagus is spasmodically closed. Regurgitation and eructation are merely due to contraction of the stomach, and some individuals can regurgitate their food at will. In infants the vomiting appears to be much of this character. A special form of eructation or regurgitation has been named *pyrosis* or *water-brash*, where, often after painful sensations in the epigastrium, especially burning, a quantity of clear watery fluid rises into the mouth, generally tasteless and neutral, but in some cases sour or acrid and acid in reaction. This has been supposed by some to be mainly

saliva; others have considered it to be pancreatic juice; but probably most of it comes from the stomach.

5. Blood may be poured out into the alimentary canal, and either rejected from the stomach (*hæmatemesis*), or passed by the bowels (*melæna*).

6. *The bowels are very commonly irregular in their action*, either in the direction of *constipation* or *diarrhœa*. It is frequently desirable to make particular inquiry into this matter, as patients offer general statements which may easily mislead. The chief points to be ascertained are the frequency of the act of defecation; whether attended by any straining; whether any unusual sensations precede, accompany, or follow it; and the quantity and characters of the materials discharged. In many cases it is imperative to make a *personal examination* of the stools, noticing their amount; color; general appearance; consistence; the form and size of any solid fæces; odor; if there are any signs of fermentation or aeration; general composition, the materials to be specially looked for, in addition to ordinary fæces, being various articles of food, either unaltered or more or less digested, foreign bodies introduced from without, calculi, especially hepatic, intestinal worms or hydatids, blood or altered blood, mucus or pus, fatty matter, fibrinous flocculi or casts, epithelial shreds, vegetable, animal, or mineral poisons, or, rarely, sloughs or portions of the intestines. Occasionally a chemical and microscopic examination is necessary, especially for the detection of poisons and parasites, or even merely to determine the composition of the fæces.

7. The *tongue* gives important information as to the state of the digestive organs, the particulars to be noted being: *a.* Its size and shape, and whether it is marked by the teeth; *b.* The color of the mucous membrane, especially at the tip and edges; *c.* Its condition as to dryness or moistness; *d.* The state of the surface, whether smooth, glazed, fissured, &c.; *e.* The size, shape, and color of the various papillæ; *f.* The presence, extent, and characters of any fur over the dorsum. It may be here mentioned also that the *mouth* and *throat* are frequently affected when the stomach is out of order, while a slimy or otherwise disagreeable *taste* is experienced, and the *breath* is unpleasant.

8. In some cases there are *abnormal sensations about the lower part of the rectum and anus*, such as pain, either constant or before, during, or after the act of defecation; fulness, weight, heat or burning, constriction, dragging, or frequent inclination to go to stool, with straining. Some of these are included under the term *tenesmus*. *Hæmorrhoids* are commonly present also.

9. The methods of *physical examination* applicable to the alimentary canal have been previously indicated, and these are particularly useful in making out flatulent distension; tumor in connection with the stomach or intestines; accumulations in their interior; permanent dilatation

of the stomach; and displacement, spasmodic contraction, or obstruction in the course of any part of the alimentary canal.

10. It will readily be understood that any derangement of the digestive organs is very likely to affect the system generally. Hence numerous symptoms arise, the most important being wasting, often accompanied with a sallow or anæmic aspect; debility, sense of general discomfort, languor, malaise, and fatigue, with incapacity for effort, especially in the mornings and after meals; pyrexia, with a dry and harsh skin, or, on the other hand, a depression of temperature, with cold extremities and sweats; nervous symptoms, viz., congestive or neuralgic headache, or a feeling of weight and oppression, giddiness, irritability and petulance, depression of spirits and apathy, inaptitude for any mental effort, confusion of ideas and failure in intellectual vigor, hypochondriasis, wakefulness or drowsiness with restless and unrefreshing sleep, attended with disagreeable dreams, timidity and nervousness, pains in the limbs and back, chilliness or even rigors, especially in the evenings, creeping sensations over the body, or convulsions in children; disturbance of the heart's action, in the way of palpitation or irregularity, feebleness, sometimes accompanied with faintness or actual syncope, as well as uncomfortable sensations in the cardiac region, the pulse being weak; dyspnœa, hiccup, or asthmatic attacks; oppression across the chest and cough; changes in the urine, especially the presence of an excess of lithates, or sometimes of phosphates or oxalates, excess or deficiency in acidity, and deficiency in chlorides; menstrual derangements; and skin eruptions, such as urticaria, herpes, psoriasis, &c. It must be remarked that a tumor or solid accumulation may press on neighboring structures, and thus originate symptoms.

Certain of the symptoms will now be considered in detail, as well as some functional derangements of the stomach and intestines.

GASTRODYNIA—GASTRALGIA.

ETIOLOGY.—These terms indicate a painful affection of the stomach, due to neuralgia, chiefly met with among females, especially about the time of puberty, or when the menstrual functions are declining. The conditions with which it is mainly associated are physical exhaustion and debility; anæmia; hysteria; hypochondriasis; nervous exhaustion from depressing emotions, anxiety, or excessive mental effort; gout or rheumatism; uterine or ovarian derangements, including pregnancy; sedentary habits, with habitual constipation, or abuse of hot tea, have appeared to me to have had considerable influence in bringing on this affection in some cases. Occasionally it is produced by malaria, and in rare instances depends on central nervous disease.

SYMPTOMS.—The prominent symptom is *epigastric pain*, varying much in severity and characters, usually paroxysmal, and coming on either at regular or irregular intervals, though in many cases there is never complete relief. During the paroxysms the suffering may be extreme, especially in hysteria and gout. Frequently food gives decided relief, the pain returning as the stomach becomes empty. Sometimes indigestible substances afford more ease than those which are digestible and soothing. Some patients, however, suffer intensely when they take anything, or only after particular articles, such as hot tea. Pressure generally relieves, especially when made firmly and continuously, but there may be much superficial tenderness. Various curious sensations are often complained of in the epigastrium. During the severe attacks of pain, there may be spasm of the stomach and bowels, with cramps of the abdominal muscles. Symptoms of dyspepsia are habitually present in most cases, such as acid and gaseous eructations, flatulency, heartburn, or pyrosis. The tongue may be fairly natural. In hysterical cases, chronic vomiting is sometimes a very distressing symptom, and not uncommonly a morbid craving exists for improper and indigestible articles of food. The bowels are generally very constipated. Frequently other nervous disturbances are observed. In some instances there is considerable emaciation, especially if food is not taken, but after the chronic vomiting of hysteria it is remarkable what a slight degree of wasting there may be. Aortic pulsation is often present.

SPASM OR CRAMP OF THE STOMACH.

ETIOLOGY.—This differs from gastralgia in being an acute affection, attended with spasmodic contraction of the walls of the stomach, which may be produced by indigestible or irritating food or drink, or, in some individuals, by special articles of diet ordinarily quite harmless; drinking excess of cold water, or indulging too freely in ices, especially when the stomach is empty; acrid secretions in the stomach; flatulent distension; mental emotion; and gout.

SYMPTOMS.—There is *great* pain, which comes on *suddenly* in a series of paroxysms, with remissions, being of a griping, constrictive, or twisting character. It is most marked near the pylorus, but may be felt running across the epigastrium, or even up along the œsophagus. Pressure gives marked relief, the patient sitting up, and making firm pressure over the stomach, lying upon it, or tossing and rolling about. Often a feeling of sickness is present, and the pain may be eased by vomiting. More or less prostration is frequently observed, and occasionally even severe collapse, with cold and clammy sweats, a very feeble and slow pulse, and fluttering of the heart, which condition may actually end in death. Sometimes the spasmodic movements of the stomach can be felt externally. If they continue for some time, a little soreness and tenderness remain, but these sensations soon pass off.

Treatment.—If there is anything irritating in the stomach, an emetic of sulphate of zinc or mustard, with plenty of lukewarm water, should be given immediately. Spirits of ammonia, spirits of chloroform, tincture of opium, with various carminatives, will generally relieve. If there is acidity, carbonate of soda or magnesia may be given as well. A little brandy or gin with hot water is often very useful. Externally, the continuous application of dry heat, by means of hot plates or bags of bran, is most soothing.

After the attack, it may be well to clear out the alimentary canal by means of a brisk purgative.

Vomiting.

Etiology.—This act is excited either by some reflex irritation, or by a direct disturbance of the brain, acting through the vagus nerve upon the stomach. Its numerous causes may be classed thus: 1. *Those immediately affecting the stomach*, viz., irritating materials in its interior, whether introduced from without, or formed there: organic diseases of its coats; obstruction at the pyloric orifice; external pressure upon it; and displacements, *e. g.*, hernia through the diaphragm. 2. *Reflex irritation from other sources*, particularly the throat, intestines (hernia, worms), peritoneum, female genital organs (especially in connection with pregnancy), and testicles. Reflex vomiting also accompanies the passage of a gallstone or renal calculus, as well as other forms of severe pain. It may arise from any unpleasant smell, taste, or sight, or a sudden light. The vomiting which follows severe fits of coughing, especially in phthisis, comes under this head. 3. *Centric* or *cerebral vomiting*. The chief causes coming under this group are injury or disease of the brain or its membranes, especially meningitis; cerebral anæmia or congestion; a poisoned state of the blood, the poison either originating from without (*e. g.*, alcohol and its products, tobacco, tartar emetic, chloroform, opium and its constituents, lobelia, &c.), or being generated within the body, as in various febrile disorders, especially at the outset, uræmia or from inhaling a hot and tainted atmosphere; mere nervous shock or fright; hysteria and other so-called functional derangements, the vomiting being then probably the result of disturbance of the circulation; and the thought of unpleasant things. With regard to sea-sickness and other allied forms, such as that produced by swinging, these certainly come mainly within this class, but several theories have been proposed to explain the occurrence of vomiting under these circumstances. The peculiar movements, the appearance of objects in motion, the unpleasant odors and sights usually present, probably all aid in inducing it, though some authorities regard it as due to a peculiar disturbance of the cerebral circulation. Vomiting is a prominent symptom in migraine or sick-headache. Mor ing sickness is often associated with chronic alcoholism, being partly the result of the presence of deleterious materials in the blood, partly of catarrh of the throat and stomach, the former giving rise to fits of cough. It must not be forgotten that malingerers can sometimes excite vomiting at will.

CHARACTERS.—It is frequently requisite to make thorough investigation with regard to vomiting, in order to arrive at a correct diagnosis as to its cause, the following particulars being noted: 1. *The times and frequency of its occurrence.* 2. *The circumstances under which it takes place,* whether spontaneously; only when the stomach is empty; after any food or drink, or only after certain articles or meals, it being important also to ascertain the quantity necessary to induce vomiting, and how soon it follows the introduction of the exciting materials; in connection with some obvious reflex or centric cause, such as cough, irritation in the throat, severe pain, a bad smell or taste, smoking, drinking, mental disturbance, &c.; in certain positions or on change of posture. It must not be forgotten that many poisons give rise to vomiting, and suspicious cases might come under observation needing complete and cautious investigation as to substances which had been taken, or some of these might even be required for chemical examination. 3. *The sensations preceding and accompanying the act,* especially noticing if there is any feeling of nausea, as well as its degree, any giddiness, prostration, or pain. 4. *The manner in which the act is performed,* this being determined by *personal inspection,* if possible, especially remarking if it appears to be originated voluntarily, and whether it is performed easily, or with more or less straining and retching, attended with signs of congestion about the head. 5. *The after-effects produced,* particularly as regards the relief of gastric pain or its intensification, or upon cerebral symptoms. It may be mentioned here that the mere violence of vomiting may produce serious lesions, such as rupture of the stomach or of a vessel, apoplexy, or hernia, and it often leaves a sense of soreness over the abdomen. 6. *Examination of the vomited matters.* This is of the utmost importance, and ought never to be neglected, and the same remark applies to substances discharged by regurgitation or eructation, or brought up by the stomach-pump. The chief things to be noticed are: *a.* The *quantity* rejected; *b.* The *taste* as perceived by the patient; *c. Odor; d. General physical characters* as to *color,* and as to the *materials* of which the vomited matters are made up, whether different kinds of food, unaltered or in various stages of digestion, decomposition or fermentation; unusual substances introduced from without; blood or altered blood; gastric juice; watery fluid; mucus; bile (this being usually present only as the result of severe vomiting, being forced through the pyloric orifice); fæces; morbid products, such as calculi, worms, hydatids, portions of growths, or pus. It is also desirable to observe whether there is any frothiness, or a yeasty appearance; *e. Chemical characters.* The reaction should always be taken, and in certain cases it may be desirable to make a chemical analysis, to determine the presence of products of fermentation, gases, bile, sugar, urinary compounds, inorganic or organic poisons. Of course in any case of suspected poisoning, a complete analysis must be performed. *f. Microscopic characters.* The chief materials to be looked for are blood-corpuscles, pus-cells, cancer-cells, echinococci, sarcinæ or torulæ. The microscope is also of use in detecting certain poisonous substances. It is necessary to indicate the characters of *sarcinæ*, which are little oblong, rectangular bodies, in shape resembling minute wool-packs, being divided into four equal parts by cross lines, which correspond to dissepiments, these being again subdivided by fainter lines, so as in all to make 64, each ultimate particle consisting of an elementary square cell. Sarcinæ are only found in acid vomit, which usually presents well-marked signs of having undergone fermentation, and are most frequently observed in connection with pyloric obstruction.

By attention to the particulars just considered, aided by the history of the case, and the other symptoms present, the cause of any vomiting may generally be satisfactorily made out. It is requisite, however, to point out the chief distinctions between cerebral and gastric vomiting. 1. Nausea usually precedes and accompanies the latter, but is often absent in the case of the former. 2. The other symptoms in the one case point chiefly to the alimentary canal, especially in connection with the stomach; in the other to the brain, head symptoms being prominent. 3. The act of vomiting generally relieves any nausea, giddiness, or headache, which may precede it, when it is gastric in origin; such is not the case with cerebral vomiting.

TREATMENT.—Vomiting occurs under such a variety of circumstances, that little more can be done here than to indicate the general principles on which its treatment should be conducted. 1. The cause must be sought out and removed if possible. Thus, an emetic is not uncommonly one of the best remedies, in order to clear out the stomach of irritant matters. Any reflex excitement must be also subdued. Patients should be told to aid voluntarily in suppressing vomiting as much as they can, and be warned against producing it by coughing or any such act. 2. Attention to diet is all-important. By withdrawing food altogether, or only giving very small quantities of cool liquids, especially milk with lime-water, or brandy with weak beef tea or beef juice, sickness may often be effectually stopped. It is particularly necessary to inquire into the feeding of children, as vomiting is in these subjects so commonly due merely to errors in this respect. 3. It may be useful to attend to certain general matters, such as position, rest, and free ventilation. Especially is this the case with regard to cerebral vomiting and sea-sickness, against which absolute quiet in the horizontal posture, with plenty of fresh air, may afford some protection. Pressure by means of a girdle across the abdomen has been recommended to prevent sea-sickness. 4. The chief direct remedies for the relief of vomiting are, the sucking of small lumps of ice; effervescent draughts with hydrocyanic acid, or the latter with mucilage; iced champagne or brandy with soda-water; opium, either in pill, as the tincture or liquor opii with other remedies, or in an enema with starch; morphia in pill, by hypodermic injection, or sprinkled on a blistered surface over the epigastrium; chloroform; creasote, in drop doses in the form of pill; sulphurous acid, sulphite of soda, or hyposulphites, if there are any vegetable growths, or carbolic acid under the same circumstances; nux vomica or minute doses of strychnia, the last proving wonderfully efficacious in some instances, after all other remedies have failed. Bismuth, magnesia, or carbonate of soda, are valuable under some conditions. Dr. Ringer recommends drop doses of vin. ipecac, every hour or three times a day, according to circumstances, in many forms of vomiting; in others he finds arsenic useful. It is desirable to make all draughts as small and agreeable to the taste as possible.

External applications to the epigastrium are sometimes beneficial, those chiefly employed being sinapisms, blisters, cold by means of the ice-bag, and friction with chloroform or belladonna liniment.

HÆMATEMESIS.

ETIOLOGY.—Blood may find its way into the stomach from a great variety of causes As a rule it comes from the vessels of this organ, being usually capillary in its origin, but sometimes due to the erosion of a large vessel. It may, however, be derived from other sources, as will be seen in the following classification of the causes of hæmatemesis: 1. Traumatic, from external violence over the epigastrium. 2. Diseased conditions of the blood, especially in yellow fever. 3. Vicarious, particularly in connection with deficient menstruation. 4. Injury by foreign bodies or destructive chemical agents entering the stomach. 5. Abnormal conditions of the stomach itself. Thus hemorrhage may be the result of violent vomiting and retching, congestion from any cause, inflammation, *ulceration*, *cancer*, or rarely atheroma of the vessels, embolism or thrombosis, or varicose veins. 6. Diseases of other organs and structures, especially those in the vicinity of the stomach. These chiefly act by inducing *extreme mechanical congestion*, which may follow any great obstruction of the portal vein, but especially that due to *cirrhosis of the liver*, thrombosis of the portal vein or its branches, *pressure upon the portal trunk or vena cava inferior*, and long-continued cardiac and lung affections. Acute atrophy of the liver is often attended with hæmatemesis, which is then partly due to the state of the blood. Splenic disease may give rise to it in both ways. Sometimes a neighboring disease, *e. g.*, cancer of the pancreas, eats its way into the stomach and opens its vessels. Occasionally an abdominal or thoracic aneurism bursts into this organ. It is stated that an omental hernia may drag it downwards, and thus lacerate the mucous membrane. 7. It must not be forgotten that blood may be swallowed, either coming from the œsophagus, mouth, throat, nose, or respiratory organs. The blood of animals also is actually swallowed on purpose sometimes, by hysterical girls, or for purposes of deception.

Symptoms.—Hemorrhage into the stomach may occur, without there being any external evidences of this, either because the blood is poured out so abundantly as to kill instantly, or, on the other hand, because it is in very small quantity. In the majority of cases, but not always, there is either some obvious cause of the hemorrhage, or it is preceded by symptoms referable to the stomach, or by signs of organic disease in its vicinity. Usually the blood is rejected, and this may take place by a mere act of regurgitation, but as a rule, more or less violent vomiting is excited; though it must be remembered that this may be the cause of the bleeding. The quantity of blood discharged necessarily varies much, and it is generally more or less mixed with food and other materials. Its characters are, as a rule, very distinctive, it being non-aerated, brown or black in color, grumous, often resembling "coffee-grounds," soot or tar, and acid in reaction. If coagulated, the clots are broken up, irregular, firm and heavy. On microscopic examination, the red corpuscles are seen to be much altered in shape or destroyed, and there are abundant pigment granules. Most of these characters depend upon the action of the gastric juice. If the blood is discharged immediately or soon after its escape into the stomach, it may be quite bright and unaltered, or only slightly changed. Commonly some of it passes into the bowels, producing tarry stools.

The general symptoms indicating loss of blood will of course be present in proportion to the amount lost.

Diagnosis.—The most important matter is to distinguish between *hæmatemesis* and *hæmoptysis*, which can usually be done by consideration of the following points: 1. *The age of the patient*, hæmatemesis being more frequent later in life than hæmoptysis, except in the case of young women suffering from perforating ulcers. 2. *The previous and existing symptoms*, as indicating some condition likely to give rise to one or the other; and also the symptoms immediately premonitory to the attack, in the one case pointing generally to the stomach, in the other to the lungs. 3. *The mode of discharge of the blood*, whether by coughing, or vomiting with nausea. It must be remembered, however, that vomiting may be excited by the cough in hæmoptysis; or some of the blood may be swallowed, and afterwards rejected from the stomach. 4. *The characters of the blood*, as already described under each form of bleeding, as regards color, aeration, general aspect, reaction, and microscopic appearances. 5. In hæmoptysis, some blood usually *continues to be discharged in the expectoration* for some time after the main bulk has been expelled, which is not the case in hæmatemesis. 6. Along with hæmatemesis, *altered blood usually is seen in the stools.* 7. *Careful physical examination* will often reveal some organic cause likely to give rise to pulmonary or gastric hemorrhage; and in the former case, there may be *râles* indicating the presence of blood in the bronchial tubes.

As regards the cause of hæmatemesis, this can only be made out by a full consideration of the case in all its details. Blood coming from above may be usually detected by local examination of the throat. It is necessary to warn against mistaking the color due to altered bile or iron for that of blood.

Treatment.—The principles of treatment are the same as for other hemorrhages. In addition to bodily rest, the stomach must be kept in a state of absolute repose in severe cases, nutriment being administered only by enema; in less dangerous cases, very small quantities of *cool* liquids being alone permitted. It is useful to swallow small lumps of ice at intervals. The most efficient medicines are gallic acid or acetate of lead in full doses, with opium; or oil of turpentine. Ice may be applied carefully over the epigastrium. It is very important to stop any violent efforts at vomiting by means of hydrocyanic acid with mucilage, morphia internally or by subcutaneous injection, or an enema containing tincture of opium; at the same time a sinapism may be applied over the epigastrium. In cases of capillary hemorrhage, dependent on congestion from portal obstruction, a saline purgative is useful, or an aperient enema. Should stimulants be required for collapse, they are best administered by injection. Vicarious hemorrhage must be treated in the usual way.

Dyspepsia—Apepsia—Indigestion.

Etiology.—Difficulty and imperfection in the digestive process arise under a variety of circumstances, either in the stomach, the intestines, or both, and affecting all articles of diet alike, or only special elements of food. In ordinary language the above terms are applied to groups of symptoms depending upon interference with the gastric digestion, which will at present be alone considered. In many instances this is merely due to functional disturbance, or at all events there is no obvious organic disease, and it is to this class of cases that the terms are often limited; the same symptoms, however, are commonly associated with organic mischief, and in the subsequent remarks on this subject, it will be impossible to avoid alluding to these.

The causes of dyspepsia in general may be grouped under certain heads: 1. *Disturbances connected with the diet*, viz., excessive eating; too rapid eating; insufficient mastication and ensalivation, this being especially associated with the habit of "bolting" food, or being due to absence of teeth, particularly in old people; irregularity in meals, or their being taken too frequently or the reverse; and improper quality of food. The last may depend upon the nature of the food itself, the manner in which it is cooked, or upon its having undergone fermentation or decomposition. *Liquids* not uncommonly cause indigestion, and special mention must [illegible] made of the habit of drinking large quantities of cold water or other drink with meals, by which the gastric juice is much diluted; *of excessive indulgence in tea*, and sometimes coffee; and abuse of alcohol, particularly when it is taken at frequent intervals and strong. Injudicious use of sharp condiments with food sometimes originates dyspepsia. Idiosyncrasy causes some individuals to suffer after special articles of diet, which are usually easily digestible, such as milk or eggs. 2. *Alterations in the gastric juice.* This secretion may be in excess; deficient, even to complete suppression; or of morbid quality. The principal changes in quality are excess of acid; deficiency of acid, pepsin, or both; abundant admixture with mucus secreted by the stomach, which may even render it alkaline; and the addition of abnormal ingredients. These alterations result from: *a. Organic affections of the stomach*, especially mechanical congestion, inflammation, degeneration and atrophy of the secreting glands, degeneration of the vessels, ulceration, and cancer. *b. Morbid conditions of the blood*, in renal disease, diabetes, pyrexial conditions, gout, anæmia, &c. *c. General want of tone and debility. d. Nervous disturbance.* 3. *Changes as regards the movements of the stomach.* The expulsive power of the stomach may be interfered with in consequence of want of muscular or nervous tone, dilatation, or pyloric obstruction; or the movements are irregular; or the food passes out too soon, before it is properly digested, either in consequence of undue excitability of the stomach, or of destruction of the pyloric valve. It is by affecting the secretory and motor functions of the stomach, that many ordinary causes aid in inducing dyspepsia, such as sedentary habits; undue exertion either just before or after a meal; habitual constipation; abuse of narcotics, tobacco, tea, or alcohol; excessive study, emotional disturbance, or any form of mental shock; venereal excesses. Most important is it to bear in mind also, that dyspeptic symptoms may be entirely due to *disease of some other organ than the stomach*, and in any case not yielding to treatment, the condition of the principal organs should be ascertained.

SYMPTOMS.—In the first instance it will be well to give a general outline of the clinical phenomena which are, in different combinations, observed in dyspepsia, and then indicate the characters of the main varieties.

Uncomfortable or painful sensations are experienced over the epigastrium, chiefly after meals, either due to the state of the stomach itself to its being irritated or distended by the materials formed as the result of the imperfect digestion. Not uncommonly these are complained of also over the front of the chest or between the shoulders. There is no tenderness as a rule. In the great majority of cases appetite is impaired or lost; some patients, however, have an inclination for food, but cannot take any, or only certain things, on account of the discomfort which it produces, or they are soon satisfied. Thirst is generally absent, but may be a prominent symptom. From the decomposition and fermentation of food, result flatulent distension, with a sense of fulness and weight in the epigastrium, acidity, heartburn, and eructations. It is very important to ascertain the characters of the eructations. They consist of gases, various liquids, and undigested food. The gases are either tasteless and odorless, resulting from fermentation; or have some peculiar smell and taste, of which the chief are those resembling fish, or rotten eggs, both being associated with deficiency or arrest of secretion, and the last being due to decomposition of food, and the formation of hydric sulphide. The principal liquid eructations are the watery fluid of pyrosis, and matters having an acid, rancid, or bitter taste. Acid eructations generally indicate, not that there is excess of gastric juice, but that the contents of the stomach have undergone acid fermentation: butyric acid imparts the rancid characters. Bitter eructations probably contain bile. Nausea is felt in many cases, but vomiting is not a frequent symptom, though some patients endeavor to excite it after food, in order to relieve their discomfort.

The bowels are usually disturbed in their functions, as indicated by constipation, or, in some instances, diarrhœa, colicky pains, flatulence, and the passage of fetid gas.

The tongue, mouth, and throat are generally in an abnormal state, but they present different appearances in the different varieties of indigestion. The breath is also offensive.

The symptoms previously described, not connected with the alimentary canal, are present in variable combinations.

VARIETIES.—I. ACUTE DYSPEPSIA.—This may come on in an individual habitually quite free from dyspeptic symptoms, or be merely an exacerbation of a previously existing morbid state. It is difficult to determine precisely what the morbid condition is in many cases of acute dyspepsia, but unquestionably a good number of them are due to gastric catarrh, while others are merely instances of migraine or so-called "sick headache." Some cases are, however, true examples of simple dyspepsia, either from some error in diet, or as the result of interference with the production of gastric juice, owing to nervous disturbance from emotion, overexertion, &c.

The symptoms differ much in intensity and duration, but are liable to be particularly severe in children, especially as regards constitutional disturbance. They come on shortly after a meal, usually in about three or four hours, and are of the following nature: uneasiness or pain in the epigastrium, with heaviness and fulness, or sometimes cramp-like sensations, but no tenderness; complete distaste for food; thirst; nausea, or vomiting of undigested food and other matters, such as mucus, acids, or bile, which affords relief; eructations of gases, either tasteless and odorless or like rotten eggs, as well as of acids; heartburn; a large and moist tongue covered with a thick white or yellow fur, and sometimes presenting enlarged and red papillæ; disagreeable taste and breath; constipation usually, but occasionally diarrhœa with colicky pains. The *general symptoms* are usually very pronounced, and there is not uncommonly a sense of extreme illness and depression, with more or less pyrexia, the skin being dry; herpes about the face, or general urticaria may break out. The urine is generally concentrated, and deposits lithates; occasionally there is slight albuminuria. In infants there may be high fever or convulsions. Probably many of the cases of so-called "gastric remittent fever" in these subjects are merely those of acute dyspepsia with febrile symptoms, assuming a remittent type.

The *treatment* of this complaint is similar to that of the slighter cases of gastric catarrh, to be presently described. It is important to remove all irritant matters by emetics, aperients, or enemata.

II. CHRONIC DYSPEPSIA.—1. ATONIC.—Most of the ordinary cases of dyspepsia belong to this variety, being associated with general debility, anæmia, want of tone in the coats of the stomach, or, in some cases, degeneration of the peptic glands. The gastric juice is deficient and muscular activity impaired. The sensations in the epigastrium are mainly those of weight, fulness, and discomfort after food, without actual pain or tenderness, pressure often affording relief. Not uncommonly there is in the intervals a constant sense of sinking in the epigastrium. Occasionally œsophagismus is experienced. There is a disinclination for food, and not unfrequently for drink. Digestion is much delayed, and a quantity of foul gas is formed, as well as acids and rancid matters, causing much flatulence with various eructations. The tongue is large, marked with the teeth, pale, flabby, moist, and usually more or less furred. The mouth and throat are also often pallid, flabby, and relaxed, and the breath very disagreeable. As a rule there is habitual and obstinate constipation, the stools being firm, pale, deficient in bile, and offensive. The general symptoms are well marked usually, and it is important to notice that the pulse is feeble, wanting in tone, and easily hurried, the skin cool, soft, and clammy, with a tendency to coldness of the feet and hands, and the urine abundant and watery. The nervous symptoms incline chiefly to languor, apathy, and indisposition for any effort. Oppression across the chest, shortness of breath, cough, and palpitation, are often complained of.

2. **Irritative.**—Probably in the form of dyspepsia thus named, a condition of chronic gastritis is present to a greater or less degree. Actual pain is experienced in the epigastrium, or burning, increased by food, and generally accompanied with a little tenderness. Heartburn and acidity are also common. Appetite is impaired, but thirst is usually felt, especially for cool drinks. Occasionally vomiting takes place. Eructations occur, but are not fetid, as a rule. The tongue tends to be contracted and red, especially at the tip and edges, with enlarged papillæ; it may be furred or clean. The throat also is frequently in an irritable condition, reddened and granular, or sometimes presents follicular ulcers. Though constipation is the rule, from time to time diarrhœa, with colicky pains, is apt to set in. The skin tends to be hot and dry, the palms and soles having a burning sensation, and there is sometimes a cutaneous eruption. The pulse is frequent; and the urine often concentrated and deficient in quantity, depositing lithates. The nervous disturbance is chiefly in the direction of irritability and petulance, with restlessness. There may be considerable emaciation.

3. **Nervous.**—A variety has been described by this term, in which the prominent symptom is *pain after food*, supposed to be associated with hypersecretion, and observed chiefly in young women. It seems to be merely a form of gastralgia, and may exist alone or associated with the other kinds of dyspepsia.

4. One form deserves special notice, which is by no means uncommonly met with, especially in out-patient hospital practice, in which there is an excellent appetite, and no particularly unpleasant sensations after food, but almost as soon as it is taken it seems to pass out of the stomach, owing to an irritable condition of this organ, then rapidly traverses the intestines, giving rise to borborygmi and colicky pains, and is speedily followed by diarrhœa, the stools consisting chiefly of undigested food. Hence there is a constant craving for food, and a sense of considerable exhaustion or prostration after the passage of a stool. In some instances this only occurs the first thing in the morning; in others it follows every meal, and may thus cause great loss of flesh. In some cases under my care the symptoms have been apparently due to the habit of excessive smoking, or overindulgence in hot tea.

The *diagnosis*, *prognosis*, and *treatment* of these complaints will be considered later on, under some general observations.

ENTERALGIA—COLIC.

Etiology.—It is very probable that there are neuralgic pains in connection with the intestines, corresponding to gastralgia in the stomach; colic, however, is attended with irregular spasmodic contraction of the muscular coat. Its causes are: 1. Irritation of the bowels by improper or undigested food; cold drinks or ices; irritant, acrid, or poisonous substances; excessive or morbid secretions, especially bile; retained fæces, it being often associated with constipation and flatulence; and foreign bodies, such as fruit-stones, gallstones, or worms. 2. Organic diseases of the intestines, and the various forms of obstruction, *e. g.*, hernia and intussusception. 3. Reflex disturbance in connection with other structures, *e. g.*, ovarian and uterine affections, or the passage of a renal or hepatic calculus. 4. Morbid conditions of the blood, *e. g.*, gout, and perhaps rheumatism. 5. *Lead poisoning.* 6. Disorder of the nervous system, especially in hysteria, or as the result of strong emotion. 7. Occasionally exposure to cold, either generally or locally.

SYMPTOMS.—These are usually quite characteristic. Paroxysmal pains are felt in the abdomen, often coming on quite suddenly, and presenting remissions or intermissions. They generally begin and are most severe about the umbilical region, but may spread over the entire abdomen, and are *liable to change their site constantly.* As a rule, they are of considerable intensity, being sometimes most excruciating during the exacerbations, while their character is more or less twisting, pinching, or binding, what is commonly termed *griping. Pressure almost always gives marked relief*, the patient either bending forwards and pressing with the hands, or lying upon the abdomen, at the same time *being very restless, rolling and tossing about* from time to time. Should the spasm continue long, a little soreness may be left. Ordinarily the bowels are constipated and distended with flatus; diarrhœa may be present, however, in some conditions. Occasionally vomiting takes place, but then probably the stomach is affected. *Physical examination* generally discloses flatulent distension (except in lead-colic, which will be separately considered hereafter), while the spasmodic movements of the bowels and rolling about of flatus can often be felt. The abdominal muscles are also commonly in a stage of rigid contraction, or knotted here and there.

The patient exhibits signs of suffering in the expression, and if the pain is very severe and prolonged, there may be symptoms of more or less collapse. *Pyrexia is absent.* The attack lasts a variable time, and usually ends abruptly, being followed by a feeling of great relief and comfort.

TREATMENT.—The first thing to be attended to is to find out the cause of the colic, and get rid of this. A free aperient enema is generally useful, which may contain some turpentine or assafœtida if there is much flatulence; or a brisk purgative may be given by the mouth in less urgent cases, such as a full dose of castor oil, alone or preceded by calomel, an ordinary black draught, or one containing sulphate and carbonate of magnesia with peppermint-water. Opium is the chief remedy for the relief of pain and spasm; it is best given in the form of tincture or liquor opii sedativus, which may be combined with spirits of chloroform and tincture of cardamoms. In severe cases subcutaneous injection of morphia ay be employed. Warm carminative drinks are beneficial, or a little ot spirit and water. Should the attack be associated with hysteria, a raught containing tincture of valerian or assafœtida is indicated. The atient should be kept warm, and the assiduous application of *dry heat* ver the abdomen, with friction, will usually afford great relief. Some refer fomentations. Any signs of collapse must be combated by stimu- nts. It may be remarked that probably infants suffer often from colic, n account of improper feeding This must be prevented by careful tention to this matter, and should it occur, carminative waters may be iven, with magnesia or a little castor oil, and heat applied over the domen.

CONSTIPATION.

ETIOLOGY.—The immediate causes of this very common symptom may summed up as: 1. Mechanical obstruction interfering with the passage f the fæces in some part of the alimentary canal. 2. Deficient peristaltic ction of the intestinal muscular coat, generally due to impaired excita- ility of the nerves, especially of the large bowel. 3. Deficiency of secre- ns, particularly the intestinal secretion and bile, or, as some believe, cessive absorption, the fæces being hence too solid, while at the same me the peristaltic action is diminished.

The first class of causes will be separately considered. The last two may e associated with organic diseases, but are very frequently the con- uence of mere functional disturbance. This may arise from a great iety of causes, of which the chief are *habitual neglect of the act of def- ion*, either from carelessness, want of time, or undue modesty; indul- ce in astringent articles of diet; habitual use of opium; excess in king; *sedentary habits, especially if combined with much mental work;* vating habits, especially lying late in bed; anæmia, debility, and of tone from any cause; dyspepsia, particularly if there is much nce; most acute febrile diseases, as well as various chronic affec- especially those connected with the nervous system; uterine and in derangements; and *the presence of lead in the system.*

oubtedly some individuals are predisposed to constipation, particu- hose who are of a slow, lethargic temperament. It is more com- females, and is more liable to arise as age advances, though it is quent in young women, especially in connection with hysteria.

TOMS.—Constipation simply means that the stools are not passed ough, being at the same time generally deficient in quantity, and l. In many instances it is a mere temporary derangement; but it is the habitual condition. Some individuals *state* that their e regular, simply because they go to stool every day, but in hey suffer from habitual constipation, as they only pass small in an indurated state; hence the necessity of making close inquiry in any doubtful case. The degree of constipation varies much, but it is not uncommon to meet with patients, especially females, whose bowels are only moved once or twice a week ; and sometimes the intervals are even longer than this, being in exceptional cases quite extraordinary. Hence fæces may accumulate to an enormous amount in the intestines, distending them greatly. When discharged, they are firm, often extremely hard, dry, in scybalous lumps or large masses, frequently pale and unusually fetid. Hard excrement may set up irritation, and produce a kind of diarrhœa, attended with the discharge of mucus or pus, and thus may mislead as to the actual conditions present, the fæces being retained. The passage of indurated fæces may give rise to a great deal of pain about the anus, with straining, and sometimes discharge of blood. When retained, excrement is very liable to undergo decomposition, thus giving rise to much flatulence with pain ; the secretions are also still more interfered with, as well as the motor functions of the bowels, and dyspepsia, usually of an atonic kind, is set up. The mechanical effects of accumulated fæces are often very serious, and they may cause complete obstruction, or ulceration and perforation ; they not uncommonly can be detected by physical examination of the abdomen as tumors, which may simulate various other abdominal enlargements. As a rule these correspond in position and shape to the cæcum, or some part of the colon ; they often have a doughy feel, yielding to pressure, by which they are sometimes much altered ; and percussion generally gives a combination of dulness and tympanitic sound. In some cases, however, these accumulations produce extensive, irregular, solid enlargements, considerably resembling cancer. Therefore the possibility of any doubtful tumor being due to fæces should always be borne in mind, and the effects of aperients and enemata observed, before a positive opinion is given.

Upon the general system, the effects of habitual constipation are frequently very marked. It produces a state of nervous depression, and, by interfering with digestion and nutrition, may cause much wasting and anæmia.

TREATMENT.—It is needless to enumerate here the various remedies employed for accidental constipation, as these are discussed in therapeutic works. A few remarks as regards the management of habitual constipation are, however, necessary. 1. It is most important to impress upon patients the necessity of paying attention to the *habit of going to stool* daily, at the same hour, and *having a proper evacuation*, because if this is neglected for a long period, it becomes extremely difficult to restore the bowels to their normal activity. 2. Change in diet may assist in removing constipation. Astringent articles of food must be avoided. Bran bread, oatmeal cakes, or porridge, certainly prove efficacious in not a few cases, and figs or rather acid fruits are also useful in some instances. Any injurious habits, which tend to confine the bowels, must be avoided, and a proper amount of exercise be taken. Cold bathing with douching of the abdominal walls is often beneficial; and in women with relaxed walls, the plan of wearing a broad bandage round the body, firmly applied, is exceedingly serviceable. 3. It must not be forgotten that the inactivity of the bowels may be due to a general want of tone, and hence tonics are frequently useful, particularly those which improve the condition of the alimentary canal; the most beneficial are the non-astringent preparations of iron, mineral acids with bitter infusions or tinctures, strychnia, and extract or tincture of nux vomica. Should there be any *lead* in the system giving rise to the constipation, iodide of potassium is *the* remedy. 4. Various aperient medicines have usually to be employed, but it is highly desirable to *avoid falling into the habit* of taking these, if possible, especially those of the stronger kind, and therefore in any case, as soon as the desired effect has been produced, and the bowels have been properly emptied, purgatives should be stopped, and the patient impressed with the importance of trying to keep up a regular action by attention to the matters already alluded to. Among the most efficacious aperients, in these cases, are confection of senna or sulphur, taken early in the morning; compound rhubarb pill; sulphate of magnesia, in ʒ½ to ℥j doses three times a day, which is often beneficially combined with sulphate of iron; sulphate of potash, particularly recommended for children; aloes, in the form of extract or decoction, especially valuable if the colon is torpid; and extract of belladonna in doses of ⅙th to ¼th gr. once a day. The last-mentioned has deservedly come into high repute, and has been particularly recommended by Trousseau; a combination of this remedy with extract of nux vomica is very serviceable in some cases. Not uncommonly it becomes necessary to use stronger purgatives from time to time, such as extract of colocynth, blue-pill, calomel, jalap, or gamboge. If the bile appears to be deficient, podophyllin is valuable, or some recommend inspissated oxgall. Some of these remedies may be given in different combinations with advantage, made up into pills with extract of gentian or extract of hyoscyamus. It seems best to administer these just before or during a meal. Various aperient mineral waters are often serviceable.

The employment of simple enemata in cases of habitual constipation is not carried out to the extent which it deserves. Unquestionably an injection of water, soap and water, or a solution of salt, in the morning, will often prove very serviceable; if necessary a little castor oil may be added. The use of a suppository of soap is a popular remedy in some parts, especially in the case of children. It has been recommended to galvanize the abdominal walls.

Occasionally, as the result of long-continued accumulation, the rectum becomes greatly distended with solid and dry excrement, which has to be mechanically scooped out. Enemata may be used to aid in softening it and breaking it down.

DIARRHŒA.

ETIOLOGY.—Diarrhœa results either from increased peristaltic action of the intestines; an unusually liquid state of their contents, especially when due to excessive secretion; or most commonly both these conditions combined. The exciting causes of these morbid phenomena may be thus stated: 1. Irritation of the intestines by food, either taken in excess, of improper quality, or having undergone decomposition; *impure water* or other liquids; purgative medicines and irritant poisons generally; excessive or unhealthy secretions, especially bile; worms, trichinæ, and other parasites, possibly vegetable as well as animal; or retained fæces. 2. Mechanical congestion of the intestinal vessels, owing to some obstruction in the portal circulation. 3. Organic affections of the intestines, viz., enteritis, either acute or chronic; albuminoid infiltration; and ulceration. 4. Occasionally mere nervous disturbance, *e. g.*, after strong mental emotion, or from reflex irritation in connection with dentition, &c. 5. In some diseases diarrhœa is a prominent *symptom*, especially cholera, typhoid fever, and dysentery. By many it is then regarded as *eliminatory* in its character, for the purpose of carrying off some poisonous material; and the same theory is applied to its occurrence in renal disease, gout, pyæmia, and various fevers; or when it takes place as a *critical* discharge at the close of pyrexial affections. It not unfrequently sets in in the course of certain wasting chronic affections, especially towards their termination, aiding in bringing about the fatal result, especially in phthisis, cancer, splenic or suprarenal disease, and Hodgkin's disease 6. Diarrhœa is sometimes *vicarious* following the rapid suppression of discharges, or the absorption of dropsical fluid. 7. There are some causes of a more general character which may give rise to this symptom, viz, exposure to changes of temperature. or excessive cold or heat; foul air, overcrowding, and other anti-hygienic conditions; excessive fatigue; emanations from decomposing animal matter; and malarial influence. The combined action of some of these, along with improper diet, gives rise to the summer and autumn diarrhœas so prevalent at these seasons. 8. Very rarely some fluid accumulation may give way into the intestines such as an abscess, peritoneal effusion, or hydatid tumor, and diarrhœa is thus produced.

CHARACTERS.—In all cases of diarrhœa it is requisite to ascertain its duration; the number of stools passed in the twenty-four hours; their relation to the taking of food, if any; and also to inspect specimens, if possible, as frequently as may be desired. The principal varieties of loose stools are *feculent*; *lienteric*, when they contain cognizable fragments of food, in some cases scarcely at all changed; *bilious*; *serous* or *watery*, also called a *flux*; *mucous* or *gelatinous*; *bloody*; *fatty*; *purulent*; *chronic* or *white flux*. As a rule the materials are more or less mixed, and by examination of the characters of the stools the cause of the diarrhœa may be often determined. Various other digestive disturbances are usually associated with it, as indicated by griping or other pains in the abdomen, sickness, borborygmi, straining at stool, or an abnormal state of the tongue. The stools may irritate the anus considerably, especially when the diarrhœa is long continued and of a watery kind. It must be remarked that patients sometimes state they are suffering from looseness, when on investigation it will be found that there is only some local discharge, especially in connection with fistula in ano. The association of mucous discharge with retained fæces has already been alluded to.

If diarrhœa is considerable or lasts a long time, it necessarily produces debility and wasting, in some instances very rapidly and to a marked degree.

TREATMENT.—The first thing as regards the treatment of diarrhœa, is to determine whether it should be stopped or not. In some instances this is not desirable, provided it is not excessive, the discharge by the bowels being preservative, as, for instance, in Bright's disease or portal congestion. Some even go so far as to promote it in certain diseases, such as cholera and typhoid. As a rule it is necessary to check it entirely or partially. For this end the diet must be strictly regulated, and this may be the only thing needed, especially in the case of children. Milk with farinaceous articles, especially arrowroot and corn flour, or weak beef tea thickened with these materials, and milk puddings, are the best articles of diet. In children, milk with lime-water properly administered will often speedily put a stop to diarrhœa. In some cases a little brandy and water, or a mixture of brandy with port wine is beneficial. Not uncommonly an aperient is indicated at the outset, with the view of getting rid of irritant materials. Castor oil, calomel, a saline draught or Seidlitz powder, or a full dose of tincture of rhubarb, act best in these cases, and they are often advantageously combined with a little opium. Antacids, such as carbonate of soda or magnesia, are beneficial when there are irritating secretions.

Among the direct remedies for combating diarrhœa, *opium* holds the first place, given either alone or with other medicines, in the form of pill, tincture, confection, various powders, enema, or as syrup of poppies. An injection of 15 to 20 minims of laudanum with ℥ij of decoction of starch often acts most beneficially. The other principal medicines administered in acute cases are prepared chalk, aromatic confection, catechu, kino, logwood, krameria, alum, dilute mineral acids, especially sulphuric, tannic and gallic acids, carbonate or nitrate of bismuth, chloral, and chlorodyne; in chronic cases tincture of sesquichloride or solution of pernitrate of iron, acetate of lead, sulphate of copper, or nitrate of silver. Ipecacuanha is invaluable in certain forms of diarrhœa. Among the most efficient combinations will be found chalk mixture with catechu and opium; compound chalk or kino powder, with or without opium; decoction of logwood with lime-water (especially valuable for children); dilute sulphuric acid and laudanum; Dover's powder, alone or with carbonate of bismuth; and, in chronic cases, pills containing acetate of lead or sulphate of copper with opium.

Creasote, carbolic acid, and other antiseptics have been employed in certain forms of diarrhœa, with the view of destroying vegetable parasites which are supposed to be causing it.

Local applications to the abdomen are frequently very beneficial, in the form of poultices, fomentations, or dry heat. Occasionally a patient may by *voluntary effort* to some extent suppress diarrhœa, especially when it is due to emotional disturbance.

MELÆNA—INTESTINAL HEMORRHAGE.

ETIOLOGY.—Most of the causes of melæna are similar to those which give rise to hæmatemesis, and it will be sufficient briefly to enumerate them thus: 1. Traumatic injury. 2. Diseased conditions of the blood. 3. Vicarious. 4. Mechanical and chemical irritation or destruction, especially by violent purgatives, cantharides, turpentine, various irritant poisons, hardened fæces, and rough calculi. 5. Organic diseases, viz., enteritis, ulceration, especially in *typhoid fever* and *dysentery*, cancer, invagination, piles, prolapsus, fissures or fistulæ about the anus. 6. Extreme mechanical congestion, from portal obstruction or after heart or lung disease. 7. A tumor eating its way into the intestines, or an aneurism bursting there. 8. Passage of blood from the stomach into the bowels in connection with hemorrhage into this organ.

CHARACTERS.—When blood appears in the stools it is, as a rule, much altered in characters, but this will depend upon its amount and source, and the rapidity with which it escapes. When in small quantities, coming from the upper part of the bowels and slowly discharged, it is more or less dark, often being quite black, and presenting a tarry or sooty aspect; or it may resemble coffee-grounds. If from the same source, but copious and speedily removed, it may be but little altered, though it is usually of a very dark color. When coming from the larger intestines, especially near the anus, it is generally quite bright and unchanged. The quantity varies much, ranging from mere streaks to an amount sufficient to cause rapid death. By attending to the quantity and appearances of the blood, its seat of origin may generally be determined, aided by the general features of the case, and a consideration of the symptoms and physical signs referable to the abdomen, not forgetting an examination of the anus and its vicinity. Care must be taken not to mistake the dark color due to bile or iron for that depending on the presence of blood.

TREATMENT.—The same remedies are useful in melæna as in hæmatemesis. Oil of turpentine is in much repute. Enemata of iced water are sometimes useful, as well as the application of ice-bags to the abdomen. Of course if there is anything about the anus causing hemorrhage, such as piles or fistula, surgical interference will be required.

CHAPTER XXX.

ACUTE GASTRIC CATARRH—ACUTE GASTRITIS.

Etiology.—1. The ordinary cause of this complaint is some *direct irritation* of the mucous membrane of the stomach, mechanical or chemical, produced by food or drink, foreign bodies, or poisons. Food may excite inflammation in any of the ways mentioned when treating of acute dyspepsia. Certain irritants require special notice, viz., very hot or cold substances; alcoholic liquids, either taken in excess or insufficiently diluted; sharp condiments; *tartar emetic* and *arsenic*. It must not be forgotten that the last two have been frequently administered for poisoning purposes, *and arsenic may be inhaled from certain green papers used for papering rooms.* 2. More or less gastric catarrh is commonly present in the course of the various exanthemata, cholera, and yellow fever, and sometimes in diphtheria, pneumonia, puerperal fever, gout, rheumatism, &c. 3. The membrane lining the stomach may be affected, along with other mucous surfaces as the result of "taking cold." 4. Drinking a large quantity of cold water, the body being heated, has been mentioned as a cause of gastric catarrh. 5. It is stated to occur occasionally as an epidemic, attended with pyrexia. 6. Gastritis occurs as the result of starvation, but is then probably originated indirectly. As regards *predisposing causes*, it may be stated that children, elderly or feeble persons, and those who have a habitually disordered stomach, are more liable to suffer from gastritis from errors in diet and other slight causes.

Anatomical Characters.—Hyperæmia of the membrane has been observed during life in cases where a fistulous opening into the stomach existed, but it may completely disappear after death. It is punctiform or capillary, and usually in isolated patches; in cases of irritant poisoning, however, it may be seen over the entire surface, though generally more marked on the top of the rugæ. Small extravasations are not uncommon. There is the usual cloudiness or opacity, with swelling and thickening of the membrane, and diminution in consistence. Superficial erosions or ulcerations and follicular ulcers are visible in many cases. In exceptional instances, when the inflammation is very intense, sloughs form, or suppuration is set up in the submucous tissue. Very rarely croupous or diphtheritic deposits have been observed.

The secreting structures undergo important changes. The cells and nuclei of the tubuli become enlarged, and numerous granules and fat-globules form, so that the tubuli are distended. The solitary and lenticular glands are much increased in size. Gastric juice is not properly secreted, but the surface is covered with a thick ropy mucus, alkaline in reaction, and containing a large number of young cells. Between the glands also there is a multiplication of cells, the "lymphatic" tissue being increased. It will be readily understood that the appearances vary greatly, according to the intensity and cause of the inflammation; when this is the result of poisoning, it often has special characters, and deposits of the poisonous substance may be present, or actual destruction of the coats may take place. For a description of these appearances reference must be made to toxicological works.

SYMPTOMS.—The circumstances just alluded to will also necessarily influence the intensity of the symptoms, these being local and general.

Local.—*Pain* over the epigastrium is almost invariable, and may be very intense. In characters it is often hot and burning, or it shoots in different directions, especially to the back. In some cases there is merely a sense of aching and soreness, or uneasiness and weight. These sensations are increased by food, cough, or a deep inspiration. Vomiting often relieves them, but in bad cases this act aggravates the suffering, especially if there is violent retching. When very intense they may be accompanied with spasm of the abdominal muscles. *Tenderness* is always present, occasionally even when pain is not complained of spontaneously. *Nausea, vomiting,* and *retching* are prominent symptoms, anything that is swallowed being usually rejected at once. The vomited matters contain much mucus, saliva, often bile, and not uncommonly a little blood, or "coffee-grounds" material. There is complete *anorexia,* with urgent thirst, particularly for cool drinks. The *tongue* is frequently small, red, and irritable, especially at the tip and margins; it may be furred in the centre, smooth, with a tendency to dryness; or large, moist, covered with a white fur, the papillæ being enlarged. The mouth is slimy, with an unpleasant taste. Constipation or diarrhœa may be present, according to the state of the intestines. The lips are sometimes the seat of herpes.

General.—In some forms of gastritis *premonitory symptoms* are observed, such as chills or slight rigors, feverishness, and general malaise. During the attack pyrexia is frequently present, though never to a marked degree, with restlessness, headache, nervous depression, and sleeplessness. In severe cases, especially when the inflammation is the result of poisoning, there is often great prostration and collapse, with a cold and clammy skin, pinched and anxious features, and a very rapid, weak, and small pulse. Hiccup is sometimes a most troublesome symptom, and the breathing may be much hurried.

DIAGNOSIS.—The symptoms above described, if present to any marked degree, are quite characteristic of gastritis; but in mild cases, or when it occurs as a complication of fevers, it may be difficult to diagnose this affection positively. The tongue often gives useful indications under these circumstances. When there is much pyrexia, constituting the so-called "gastric fever," typhoid fever may be simulated at first. The course of temperature, special abdominal symptoms, enlargement of the spleen, and peculiar eruption, are, however, sufficiently distinctive of the latter as a rule.

PROGNOSIS.—Generally this is favorable, except when the gastritis is the result of poisoning, or when it occurs severely in weak persons. In some cases the complaint tends to become chronic.

TREATMENT.—1. If there is anything in the stomach causing irritation, the first thing to be done is to get rid of this by means of an emetic of sulphate of zinc, mustard, or ipecacuanha, with plenty of lukewarm water, or by the stomach-pump, if necessary. A purgative at the outset is often useful, such as a dose of calomel, followed by a black draught, castor oil, or a draught containing sulphate and carbonate of magnesia; in some cases an enema may be advantageously employed. It is decidedly objectionable to administer purgatives repeatedly, but, if necessary, an enema may be given from time to time.

2. In addition to keeping the patient quiet, or even in bed, it is most important to allow the stomach to remain in a *state of rest*, either complete or partial, according to the severity of the disease. In dangerous cases no food should be taken by the mouth, but nutrient enemata administered instead. If food is permitted, it must be entirely of a liquid character, or only thickened with some farinaceous substance, and given in small quantities at regular intervals. Milk diluted with lime-water or soda-water, or mixed with a little arrowroot or corn-flour, weak beef tea, mutton- or chicken-broth, are the most suitable articles of diet. The patient must be prevented from drinking large quantities of water, which is usually much craved for, but may suck small lumps of ice frequently, and this gives much relief. As a rule stimulants are not required, but sometimes brandy in small doses, well diluted or mixed with soda-water, milk, or beef tea, seems to be decidedly beneficial, or a little champagne with soda-water. Should there be prostration, considerable quantities of alcoholic stimulants may be called for, and if the stomach will not bear them they must be administered by injection.

3. The symptoms are best allayed by the administration of *antacids* and *sedatives*. Among the most serviceable remedies may be mentioned a combination of bismuth with hydrocyanic acid and opium; iced effervescent draughts of ammonia, potash, or soda, with hydrocyanic acid, and tincture of cardamoms; solid opium in doses of gr. ½ to gr. j, or, better still, morphia in doses of gr. ⅛th to gr. ¼th; 4 or 5 minims of hydrocyanic acid with a little mucilage; magnesia and the alkalies, alone or in combination with the other remedies. These must be given at intervals of from two to four hours, according to circumstances, and it is desirable to make the bulk of the medicine as small as possible.

The alternation of effervescents with a pill containing opium or morphia is frequently attended with the best results. In treating children of course every caution must be exercised in employing the powerful drugs mentioned.

4. *Local Treatment.*—Occasionally it might be advisable to apply a few leeches to the epigastrium, but venesection is never required. The constant application of heat and moisture over the abdomen by poultices, fomentations, or spongiopiline is highly beneficial. Cold is employed by some practitioners. Sinapisms are sometimes called for, but severe forms of counter-irritation are of doubtful efficacy. When gastritis follows gout an endeavor may be made to excite inflammation in the joints.

5. Much care is needed during convalescence as regards diet, hygienic management, and medicinal treatment. Various remedies employed in the more chronic complaints, and which will be hereafter considered, are useful if given with care, such as bitters, acids, pepsin, iron, &c. The state of the bowels must be attended to, and mild purgatives given if required. Vichy and Seltzer waters are often beneficial.

Chronic Gastritis—Chronic Gastric Catarrh.

Etiology.—In its more or less chronic form gastric catarrh is met with—1. Occasionally as the remains of an acute attack. 2. As the result of constant or repeated irritation of the stomach, particularly by indigestible food, tea, alcohol, purgatives, stimulant and bitter medicines, hot condiments, and arsenic. 3. In connection with chronic organic diseases of the stomach, especially cancer, ulceration, and albuminoid disease. 4. As the consequence of interference with the portal circulation, which leads to persistent venous congestion of the stomach. 5. Associated with constitutional disorders, particularly phthisis, renal disease, gout, syphilis, or any low general condition of the system.

Anatomical Characters.—The color of the membrane is changed, there being increased vascularity, and the vessels may be permanently distended; frequently, especially if there has been mechanical congestion as well, portions of the surface are seen to be gray, slate-colored, or almost black from altered blood-pigment. Small hemorrhagic erosions are not uncommon. The surface is covered often with a thick tenacious mucus. One of the most important changes is a thickening of the membrane, attended with increased firmness and toughness, sometimes so marked that it has a leathery feel, although there may be at the same time slight superficial softening. More or less opacity is also observed, some spots appearing quite opaque and white from fatty degeneration. Mammillation is a common appearance near the pylorus. The intimate changes which occur have been described by Wilson Fox, Fenwick, Handfield Jones, and others as an increase in the interstitial tissue, including the "lymphatic" elements; distension of the solitary glands, and alterations in the gland structures here and there, in the way of fatty degeneration and destruction of their epithelium, thickening of their membrane, contraction and puckering, formation of minute cysts, or atrophy; sometimes fatty degeneration of the membrane throughout in spots, including the small vessels. The "mammillation" may be due to the enlarged glands or to contraction of the muscular fibres which surround them.

Symptoms.—As previously remarked, what is termed irritative dyspepsia is probably due to gastritis in a chronic or subacute form, but it may be difficult to affirm positively in some cases that this condition exists. The symptoms referable to the alimentary canal which are most characteristic are considerable uneasiness over the stomach, amounting in some cases to actual pain, though never severe, generally increased soon after meals, especially after taking hot or spiced articles; some tenderness; sense of heat and burning, sometimes extending over the chest; frequent heartburn, with acidity, and acid or gaseous eructations; impaired appetite, the patient being soon satisfied, though there may be a feeling of emptiness and longing for food; thirst, especially for cool drinks, often particularly marked between meals and in the evenings; a small, bright-red, raw-looking, and sore tongue, with enlarged and red papillæ, or the last condition alone, there being usually more or less fur as well, though in some cases the tongue seems abnormally clean; an irritable or catarrhal condition of the lips, mouth, and throat, sometimes with aphthæ or follicular ulceration; hot and disagreeable breath; intestinal disturbances, either in the way of constipation with pale and dry stools, or of diarrhœa with lienteric stools, flatulence, and colicky pains. There is often a feeling of sickness, but actual vomiting is only common in certain forms of this affection, viz., when it is associated with chronic alcoholism, renal disease, or portal congestion, sickness being then frequently a prominent symptom in the mornings and after meals. In some cases a large amount of alkaline mucus is brought up, when the affection is termed "gastrorrhœa."

The system suffers more or less, as a rule, there being the various nervous and reflex symptoms formerly described, often accompanied with loss of flesh, debility, sallowness or slight jaundice, a little pyrexia, especially in the evenings and after food or stimulants, with a dry and harsh skin, a sense of burning in the palms and soles, and flushing of the face. The urine is frequently disordered, depositing urates abundantly, or in some cases phosphates or oxalates. Cutaneous eruptions are not uncommon, and sometimes there are signs of premature decay.

The *diagnosis*, *prognosis*, and *treatment* of this and other chronic affections of the stomach will be considered in a separate chapter.

CHAPTER XXXI.

ULCER OF THE STOMACH.

Some writers describe all ulcerations of the stomach under one group; others distinguish two chief forms, viz., the *perforating*, characterized by its tendency to perforation; and the *chronic*, which is attended with much thickening of tissues. These differ as to the individuals in whom they severally occur, the *perforating* being most frequent in *young females* and the *chronic* in *old males*.

Etiology.—On the whole, females are more subject to this affection than males. It is most common between the ages of 18 and 25 or 30, and in advanced life. Among its immediate causes have been mentioned intemperance, bad living, mental anxiety, tuberculosis, various lowering diseases, disorders of menstruation, suppression of hæmorrhoidal flux, pregnancy, and healing of cutaneous ulcers. Much doubt exists, however, on this matter.

ANATOMICAL CHARACTERS.—The *perforating ulcer*, or the *early condition of ulceration*, may be seen in various stages of destruction of the coats of the stomach, beginning with the mucous membrane and extending to the peritoneum. Its edges are even and clean cut, as if punched out, without any thickening, and as each subsequent coat is destroyed over a smaller area than that above it, the ulcer has a somewhat conical shape, the apex being next the peritoneum, and the margin of each layer being well defined. The floor is smooth, but may be sloughy or covered with extravasated blood.

In the *chronic ulcer*, after this has existed for some time, its margins and floor become greatly thickened and indurated by the formation of a nucleated and granular substance, which subsequently develops into imperfect fibrous tissue. The different layers become matted together over a variable extent, but the ulcer remains distinctly conical or funnel-shaped, the mucous membrane being inverted. Granulations are sometimes seen on its surface. It is important to notice that in this condition of the ulcer firm adhesions tend to form between the stomach and neighboring organs, by which the evils of perforation are prevented.

The superficial form of gastric ulcer is usually circular or oval at first, but it may become irregular from extension or by two or more coalescing. The size generally varies from ¼ inch to 1 or 1½ inch in diameter, but the length may reach 5 or 6 inches. Usually there is only one ulcer, but two or more are sometimes found, or cicatrices of former ulcers may be met with. The most frequent seats of ulceration are the posterior surface, the neighborhood of the smaller curvature, and near the pylorus; it is rare on the anterior surface, near the greater curvature, or at the cardiac end. *Chronic ulcer* is most frequent in the vicinity of the pylorus.

The *mucous membrane* around the ulcer may be healthy, or present signs of hemorrhages and extravasations, polypoid vegetations, acute or chronic catarrh.

Cicatrization frequently occurs, generally by granulation, as rix may either be smooth or puckered, or give rise to ckening, contraction, and alteration in the form of the leading to stricture, especially at the pyloric end, with istorted shapes. Sometimes an ulcer does not com- catrize, or it is healing at one spot and extending at

ation is very liable to happen if there is no thickening on, especially when the ulcer is in a position where it is o much disturbance by movement and distension of the and where adhesions cannot easily form, as in the an- ll and near the smaller curvature. The peritoneum small slough, and then gives way by a little sharply or slightly torn opening. If adhesions have formed, the y be destroyed completely, and ultimately even consider- tions of contiguous organs. In some cases the thickened m is distended in the form of a pouch.

OLOGY.—Gastric ulcer is considered by most authorities te in an interference with the supply of blood to a por- he mucous membrane, the vitality of which is thus im- o that it is acted upon by the gastric juice and destroyed, er tissues being subsequently attacked in the same way. y result from extensive extravasations into the tissues of ach; embolism; degeneration or narrowing of the arte- rarely, submucous suppuration. Some pathologists re- ulcers as being the result of inflammation.

OMS.—Occasionally gastric ulcer is unattended with any ristic symptoms, until some serious event, such as per- or the opening of a large vessel, reveals the gravity of In many instances they are for a time but ill-defined ure, especially in the chronic form of ulceration. The phenomena which are suggestive of ulcer may be thus ed: *Localized pain* in the epigastrium, severe, of aching, or burning character, or attended with a feeling of sick- prostration, persistent but increased after food, especially tain articles, such as hot tea, with *tenderness* on pressure; particularly after taking anything, not attended with usea or retching, as a rule, and generally affording relief in, the vomited matters sometimes containing *sarcinæ* *ventriculi*, or fragments of the tissues; *hæmatemesis*, either due capillary rupture or the opening of a large vessel, generally followed by *melæna;* various *dyspeptic symptoms*, such as flatulence, eructations, pyrosis, deranged appetite, and constipation or occasional diarrhœa; with more or less general wasting and debility, which may be accompanied with a dull, earthy, cachectic aspect, or, in young females, with a marked anæmic or chlorotic tint, *menstrual functions* being also usually much disturbed in these subjects.

There are some points of importance which require comment. The exact site of the pain will vary with that of the ulcer; *it is* most common a little to the right of the epigastrium; if the ulcer is on the posterior surface *it may be referred to the back on one side of the spine.* Movement and posture often influence the degree of suffering, and it is frequently aggravated by mental emotion, or, in females, during the menstrual periods. In the chronic form *pressure not uncommonly gives marked relief*, and hence patients voluntarily press against the epigastrium. Occasionally food also gives ease, instead of increasing the pain. Vomiting is chiefly observed when an orifice or its vicinity is affected, especially the pyloric. The interval which elapses between the taking of food and any sickness or aggravation of suffering, will often indicate the situation of the ulcer: thus, if it is near the cardiac opening these effects are produced immediately; if about the pylorus, they do not follow for some time. In some instances the pyloric orifice is permanently obstructed, and the stomach consequently dilated, the signs of which will be presently indicated. No distinct tumor can ever be felt, but occasionally, when there is much thickening and induration about the pylorus, this can be made out by careful manipulation. The tongue is often abnormal, but has no special characters. Salivation is said to occur sometimes, the saliva being deficient in sulphocyanides.

The degree of the general symptoms will depend mainly on the amount of pain, interference with digestion and nutrition, and hemorrhage. In exceptional instances of perforating ulcer pyrexia has been noticed.

The *course* and *duration* of cases of gastric ulcer are very variable. As a rule they are chronic, but occasionally the perforating variety appears to be rather acute in its progress. Many cases terminate in cicatrization and recovery; but death is also a common event, occurring either suddenly or rapidly from perforation or hemorrhage, or gradually from asthenia.

CHAPTER XXXII.

CANCER OF THE STOMACH.

ETIOLOGY.—Among general predisposing causes of this disease, *age* is the most important. The majority of cases occur between 50 and 60, but the complaint may be met with from 30 to 70, and, exceptionally, beyond these extremes. The male sex; hereditary tendency; a high social position; and mental anxiety are also believed to predispose. As local causes have been mentioned long-continued pressure; injury; and the repeated action of irritants upon the stomach, such as hot spices or strong spirits.

ANATOMICAL CHARACTERS.—All forms of cancer are met with in the stomach, but *scirrhus* is by far the most common. It is here, however, that the *colloid* variety is usually observed, compared with other organs. The pyloric orifice and its vicinity is the part of the stomach generally involved, but the cardiac end, curvatures, fundus, or body may be attacked. The cancer may be very limited in extent, especially scirrhus, or widely spread, implicating a great portion of the walls, which is especially the case with colloid, and when the body of the stomach is affected. In some cases it passes from the stomach to the œsophagus, but shows no tendency to invade the duodenum. The submucous tissue is the primary seat of the deposit usually, and it then involves the deeper coats and partially the mucous membrane. Colloid, however, according to Dr. W. Fox, seems to begin in the glandular structures. The coats are in most cases infiltrated, but encephaloid cancer is prone to form nodular masses in the submucous tissue.

The actual characters of the cancerous part will necessarily vary with the nature and amount of deposit; in most instances it will be found hard, dense, thickened, contracted, and whitish on section, but each variety presents its own peculiar characters. Not unfrequently the mucous membrane becomes destroyed, and an ulcer forms, but there may be extensive cancer without any ulceration. The ulcer has thick ragged margins and an uneven floor, in which are cancerous masses. Adhesions often form with other organs, which may become involved by extension; or occasionally perforation takes place into hollow viscera or other parts.

The *seat of the cancer* influences much the shape and size of the stomach and the state of its walls. When it involves the pylorus the organ becomes much dilated and its walls hypertrophied. On the other hand it is contracted, shrunken, and small when the cardiac orifice is affected. If the middle of the body is alone implicated, the cavity is greatly contracted here, so that the stomach assumes an hour-glass form.

Cancer along the curvatures distorts the stomach in various ways by its contraction, often drawing the orifices near together. In some instances the organ is displaced considerably, owing to a mass at the pyloric end having fallen by its own weight and become adherent in some abnormal position. Such a mass may press on various structures and thus lead to other morbid conditions, *e. g.*, on the portal vein, causing ascites.

Acute or chronic gastritis and glandular degeneration are generally observed to a greater or less extent.

Cancer of the stomach is almost always primary, but it tends to involve other abdominal organs and structures, either by extension or as a secondary deposit, the latter being particularly common in the liver.

SYMPTOMS.—For some time, and in some cases even to the last, the symptoms are merely those of dyspepsia, with wasting; or the disease may be entirely latent. As a rule, however, there are prominent *local* and *general* symptoms.

Local.—*Pain* is generally present in some part of the epigastrium, varying with the seat of the cancer, and though at first a mere sense of weight and uneasiness, it usually becomes very intense. It may be continuous or intermittent, and is often paroxysmally increased. Food aggravates it as a rule, but not so distinctly as in the case of ulcer, and it may be relieved by food. In character it is frequently described as aching, burning, or gnawing, as well as lancinating, shooting towards the hypochondria, back, or shoulders.

Tenderness is almost invariable, with a feeling of soreness, even when there is no spontaneous pain, the slightest touch being sometimes unbearable. This may be associated with some evident tumor or thickening.

Nausea and *vomiting* are rarely altogether absent, usually becoming more frequent and distressing as the case progresses. Vomiting is particularly observed if the orifices are involved, or if there is ulceration, and the time of its occurrence after food varies according to the seat of cancer, in the same manner as has been described when speaking of ulceration. The rejected matters not uncommonly contain numerous *sarcinæ ventriculi* and *torulæ*, as well as occasionally the elements of cancer; when there is ulceration they may be very offensive.

Hæmatemesis is a very frequent and early symptom, but chiefly on the small scale. Large hemorrhages are stated only to occur in the later stages, and not to be so common as in connection with ulcer, but the former statement is certainly not always true, according to my experience, Melæna is often observed at the same time, or even independently of hæmatemesis.

Appetite varies, and the tongue has no constant characters. Among other frequent symptoms are flatulence; gaseous eructations, at first odorless, afterwards often fetid; acidity; gastrorrhœa; obstinate constipation; and hiccup.

Physical examination may reveal some of the following conditions, and it should in all suspected cases be carefully and repeatedly made, especially *when the stomach is empty.* 1. *A sense of fulness and resistance over the epigastrium*, perhaps not uniform, detected by manipulation and percussion, the sound produced by the latter being somewhat dull and muffled. This indicates extensive infiltration of the walls. 2. A *distinct tumor*, especially in connection with *scirrhus of the pylorus.* Its site is usually the right hypochondrium or epigastrium, but it may be in the iliac fossa from displacement, or, in females, near the umbilicus. The tumor is small, circumscribed, dense, hard, and irregular. Not usually movable by manipulation, it sometimes alters its posit with change of posture and with varying degrees of distensio the stomach. There is *dulness on percussion* over the tum Aortic pulsation may be transmitted through it. It is sai tumor may disappear completely by sloughing or ulceration. The stomach may yield the signs of dilatation. 4. The abdo is in most cases retracted, and when this condition is prese tumor can be more easily detected, and may even be visible. the other hand, in exceptional instances a pyloric tumor pr on the portal vein and thus causes ascites.

The *general symptoms* are, as a rule, very pronounced, *viz.* early and rapidly progressing emaciation and debility, ultimately often becoming extreme; signs of the cancerous cachexia, the skin being dry and harsh, with a dirty, sallow, or earthy hue, and the features sunken and pinched; marked anæmia, especially if much blood has been lost, with a tendency to œdema of the legs, or sometimes to thrombosis; weakness of the heart and pulse; lowness of spirits, with a melancholic and anxious expression, or irritability and moroseness; and disturbed sleep. Occasionally jaundice is observed, owing to pressure on the common duct. In the later stages the temperature is now and then a little elevated, but pyrexia is absent as a rule.

The *course* and *duration* are subject to some variations. Generally the progress is continuous and rapid; sometimes there are slight or even marked remissions in the symptoms, but these seldom last for any length of time. Cases rarely extend beyond two years from the first appearance of symptoms, and the average duration is said to be a little over a year.

PYLORIC OBSTRUCTION AND ITS CONSEQUENCES.

ETIOLOGY.—The pylorus may be obstructed either from some morbid condition of the stomach, inducing stricture or stenosis, or from external pressure. The following list includes the main causes:

1. *Cancer of the walls*, especially scirrhus, which is by far the most frequent cause. 2. Cicatrization of an ulcer. 3. Corrosive poisoning and its results. 4. Hypertrophy of the coats, with

thickening of the submucous tissue. 5. Spasmodic contraction of the muscular coat, due to an ulcer in the vicinity. 6. External pressure from—*a*, tumor of the pancreas; *b*, cancerous masses projecting from the liver; *c*, enlarged glands; *d*, very rarely a tumor connected with the gall-bladder.

The effects of obstruction are that the stomach becomes dilated, while its walls hypertrophy, especially the muscular coat, in the endeavor to overcome the interference with the passage of the food, the intestines at the same time being contracted.

SYMPTOMS.—There may be evidences of some organic disease of the stomach about the pylorus, or of something in the vicinity causing pressure, but the only positive indications of pyloric obstruction are derived from the *characters of the vomiting* and of the *matters rejected;* with the presence of the *physical signs of an enlarged stomach.* The vomiting comes on some hours after food, or *only at intervals of a few days*, a great quantity being then discharged. The vomit *never contains bile*, but is *strongly acid*, presents *numerous sarcinæ* and *torulæ*, and *readily ferments.* The stomach may be so much enlarged as to cause general distension of the abdomen. The physical characters of this enlargement are as follows: (i.) The shape of the stomach may be retained and made out by careful examination, while movements can sometimes be felt or excited in it. (ii.) On succussion, a splashing sensation is often experienced when the stomach contains liquids. (iii.) Percussion shows extension of the stomach-note upwards, and downwards if the organ is empty. If it contains food or fluid, however, there is dulness below, as after a good draught of water, and this may be made to alter its position by changing the posture of the patient. (iv.) If a probang is passed by the œsophagus, it may reach the bottom of the stomach, and be then felt through the abdominal walls. (v.) Emptying the stomach by means of the stomach-pump may afford some aid. (vi.) Auscultation reveals a splashing sound on succussion; the sound of food or liquids falling into the stomach when swallowed; or loud heart-sounds reverberating through the space. (vii.) The heart may be displaced upwards. Occasionally the patient has a sensation as if the food passed too low in the abdomen.

It may be mentioned that distension of the stomach may equally result from obstruction of the duodenum, or, rarely, of the upper part of the jejunum.

A certain degree of *dilatation* is due sometimes to deficient tone of the muscular coat, from weakness or want of proper innervation. As exceptional causes, are to be mentioned local paralysis near the pylorus, interfering with the expulsion of food: hernia of the stomach through the diaphragm, or its displacement by an omental hernia; and accumulations of foreign substances in its interior, such as hair. It has been attributed to sarcinæ, but this is extremely doubtful.

CHAPTER XXXIII.

GENERAL DIAGNOSIS OF CHRONIC GASTRIC AFFECTIONS.

It is proposed now to point out the main questions in the diagnosis of stomach disorders which are presented in practice, and to indicate the circumstances on which this is determined.

1. Many cases come under observation, evidently belonging to the class of dyspeptics. It is requisite to determine what form of dyspepsia is present, and what is its cause. The two chief varieties to be distinguished are the *atonic* and *irritative*, which are mainly separated by the difference in the intensity and characters of the sensations in the epigastrium; the conditions of the tongue, mouth, and throat; the absence of thirst in the atonic form; the minor degree of general disturbance in the same, which is also of a different nature, there being no fever. Further, diarrhœa is often present in the irritative form, while in atonic dyspepsia there is generally persistent constipation. With regard to the cause of any dyspeptic symptoms, this must be ascertained by a satisfactory inquiry into the habits of the patient, and into the condition of the various organs and general system. It is particularly necessary to recollect that they may depend upon a state of catarrh kept up by portal congestion, or upon some constitutional disorder, especially Bright's disease; or that they may be

merely premonitory of some serious organic affection of the stomach. In order to see what elements of food are not properly digested, it has lately been proposed to evacuate some of the contents of the stomach at certain intervals by the stomach-pump, and then examine them.

2. It is frequently difficult to diagnose between mere functional dyspepsia and the less serious organic affections, viz., glandular degeneration and chronic gastritis. The opinion has been already expressed, that in many cases of irritative dyspepsia the latter condition is often present, and it is scarcely practicable to draw a line between them.

3. Young women not unfrequently present themselves, complaining of *severe gastric pain*, in whom it is difficult to determine with certainty whether they are suffering from mere *gastralgia* or *nervous dyspepsia*, or from *perforating ulcer*. In any really doubtful case, it is safer to presume that the latter is the condition present. The chief distinctions are that in ulcer the pain is usually more localized, and is almost always much increased by food; there is a sense of soreness and deep tenderness, but often less superficial tenderness; vomiting occurs after food, usually affording relief, and there may be hæmatemesis; emaciation is generally marked, while there are none of the neuralgic pains in other parts, or signs of hysteria, so common in gastralgia.

4. In persons advanced in years especially, but occasionally in others, symptoms are not uncommonly present, which render the diagnosis between mere *functional disorder* and grave *organic disease* of the stomach—either *chronic ulcer* or *cancer*—for a time very doubtful. Persistent disturbance of digestion without any evident cause, not yielding to proper treatment, should lead to the suspicion of the existence of the latter, though it must be remembered that this may be due to glandular degeneration. The diagnosis would be rendered more positive by the existence of marked localized pain, increased by food, tenderness, vomiting, hemorrhage, and progressive emaciation. Some of these symptoms, however, especially pain, I have known to be very intense in connection with mere functional disorder, in females and gouty subjects. With regard to hemorrhage, it is well to observe that the blood, if in small quantity, is sometimes *not vomited*, but

passed entirely in the stools, and therefore in any doubtful case it is desirable to look to these.

5. The diagnosis of *chronic ulcer* from *cancer* is frequently very difficult at first. The circumstances in favor of the latter are—the patient being a male, and advanced in years; hereditary history of cancer; pain more constant and less influenced by food and vomiting; tenderness slight or absent; hemorrhage not occurring in the earlier stages, but *late* in the case, and being on the *small scale;* marked and early digestive disturbances, appetite being much affected; considerable and rapid wasting, especially if independent of vomiting or loss of blood; and evidences of the cancerous cachexia. Later on, the *presence of a tumor*, especially near the pylorus; signs of obstruction of the pyloric orifice, with dilatation of the stomach; inefficiency of treatment; the almost continuous and speedy progress of the case; and perhaps signs of cancer in other parts, usually serve to render the diagnosis plain. It is necessary to guard against mistaking a *contracted rectus* for a tumor.

With regard to the *part of the stomach involved*, this can often be made out by noting the exact seat of the pain and tenderness; the relation of pain and vomiting to food and posture; the state of the stomach, as to contraction or dilatation; and the locality of any physical signs.

6. Affections of the stomach may simulate neighboring diseases, or *vice versâ*, especially disease of the duodenum or head of the pancreas; cancer in the small or large omentum; hepatic affections; the passage of a gallstone; affections of the glands in the vicinity; affections of the transverse colon; and painful conditions of the abdominal walls. A careful consideration of all the features of a case may be necessary in order to arrive at a correct diagnosis.

7. Occasionally *rare conditions* in connection with the stomach give rise to much difficulty in explaining symptoms associated with this organ. Of such which have come under my own notice, I may mention abscess in the walls of the stomach and hernia through the diaphragm. On the other hand, it must be remembered that extensive organic disease may exist, even cancer involving a considerable portion of the organ, without any, or

with only slight local symptoms, there being merely profound interference with the general nutrition.

GENERAL PROGNOSIS.

The prognosis in any case of dyspepsia will depend mainly on the time the symptoms have lasted, their causes and whether these can be removed, and the ability and willingness on the part of the patient to submit to appropriate treatment. When indigestion has become a habitual state, it may be very difficult to cure, especially if it is associated with permanent organic changes in the coats and glands of the stomach, with conditions keeping up venous congestion, or with some general disease; or if the patient persists in injurious habits. Most cases may, however, be restored if properly attended to, or, at all events, much improved. If there is reason to believe that the mucous coat of the stomach with its glands has undergone serious morbid changes, especially after the abuse of alcohol, this condition is highly dangerous, from the interference with digestion and nutrition, and the patient may gradually sink from marasmus. Persistent dyspepsia occurring in the course of various chronic diseases often makes their prognosis much more grave.

Gastralgia is often difficult to get rid of, and may be serious, especially in elderly persons, on account of the pain, and through preventing them from taking food.

Gastric ulcer is necessarily a dangerous lesion. The variety which occurs in young women is the more immediately grave, on account of its tendency to *perforation* and *hemorrhage.* A large proportion of these cases, however, recover, the ulcer cicatrizing. The chronic ulcer shows much less disposition to heal, but is not nearly so liable to a speedily fatal issue, death usually taking place slowly by asthenia. In proportion to the severity of the stomach symptoms—pain, vomiting, and hemorrhage—is the prognosis more grave. The effects of cicatrization may become serious.

Cancer is necessarily a fatal disease, and the question can merely be one of duration. This must be determined by the characters of the symptoms and the progress of the case. Rarely does the duration extend beyond two years, and generally it is much less than this.

General Treatment.

There are certain principles to be followed in the management of all chronic gastric affections which will now be considered, anything calling for special notice being pointed out in the course of the remarks.

1. *Regulation of the diet* is obviously the first consideration in all cases. This involves not merely directions as to what should be taken, but also with regard to quantities, intervals, proper mastication, &c. In many cases of dyspepsia this is the chief matter needing attention, without which all other means are usually unavailing. It would occupy too much space to indicate all the modifications of diet required in different instances of stomach derangement, and, indeed, this has generally to be determined by the experience of each individual patient. There are, however, certain broad facts which may be stated. In all cases substances which are known to be indigestible, such as pastry, cheese, many fruits and vegetables, fresh bread, made dishes, &c., must be avoided, and plain food only be taken. Meat is decidedly beneficial in atonic dyspepsia, fresh beef and mutton, not too fat, and well cooked, being those which are most suitable. Pork, veal, and salted meats must be forbidden. In proportion to the degree of irritation present, especially if there is chronic gastritis, does it become requisite for the diet to be more bland and easily digestible. In such cases white fish, light soups, chicken, game, jellies, calves' feet, sweetbread, the yelk of egg, milk-puddings, and such articles, answer best, and it is often more desirable to give food in small proportions, at rather frequent intervals, than in any considerable quantity at a time.

The question of *drink* calls for special remark. Many suffer from *abuse of tea*, and it is frequently desirable to stop this absolutely, and order cocoa or milk instead, the latter being advantageously mixed with lime or soda-water. Instructions must also be given against taking *large quantities of cold water*, especially during meals. A glass of good bitter ale or stout with meals is often beneficial in atonic dyspepsia, provided it does not produce flatulence; a moderate quantity of wine may also be useful, just before and with food, especially dry sherry, champagne, claret, or hock. When there is an irritable condition of the stomach, much care must be exercised in the use of stimulants.

In functional disorders of the stomach attended with severe pain after food, it is sometimes requisite to insist upon patients taking meals properly, as they will otherwise go without, and are thus only aggravating the mischief; underdone meat is beneficial in many of these cases, and it may be pounded. Where mastication is impracticable, food must be artificially divided before it is taken; but in old people and others who have lost their teeth, it is often extremely serviceable to provide a set of artificial teeth.

In treating *gastric ulcer*, especially the *perforating* variety, diet is all-important. To promote healing and prevent untoward events, a main object is to keep the stomach in *as absolute a condition of rest as possible.* Hence anything which can in the least irritate or give rise to flatulent distension must be absolutely shunned. Further, the food should consist of liquids or pulpy materials, such as thick soups, pounded underdone meats, meat extracts, milk, either alone, or thickened with corn-flour or arrowroot, the yelk of eggs beaten up or soft boiled, and these must be given only in *small and regulated quantities, at stated intervals.* In the case of young women it has been well recommended to *keep the patient in bed* for some weeks, so that less nutriment may be required, and thus the stomach be less disturbed. Some have even gone so far as to advocate that the patient should be entirely supported by nutrient enemata, but this is rarely required.

In *cancer* no rules can be laid down, but as digestible and nutritious food as possible must be given, each case being managed on its own merits. It may not be altogether useless to remark, that both in cancer and ulcer the *position* assumed during the taking of food has sometimes an influence in the way of relieving pain and other symptoms.

In some cases it is requisite to be particular as to the *elements of food* which are permitted. Thus, if there is much tendency to acid fermentation, starchy substances are contraindicated. Marcet and Pavy have recommended the employment of food *artificially digested* before its administration, in certain conditions.

2. The next matter requiring attention is *general hygienic management.* Many cases of functional disorder of the stomach as

well as of chronic catarrh, and even of ulceration, are greatly benefited by attention to various matters coming under this head, of which only the chief can be mentioned, without entering into details, viz., the taking of a proper amount of exercise, but not immediately before or after a meal; avoidance of much mental work, harassing anxiety, and brooding over symptoms; mingling in cheerful society; change of air and scene; abstinence fron injurious habits, such as intemperance or excessive smoking; promotion of the action of the skin by cold bathing or douching, if it agrees, or by an occasional warm-bath or Turkish-bath; and the wearing of warm clothing, with flannel next the skin.

3. Coming next to the employment of therapeutic agents, first those medicines require notice which act more directly upon the stomach. These must not be given indiscriminately, and much care is required in their administration. They act by increasing the appetite; giving tone to the stomach, and aiding its muscular contractions; promoting the secretion, and improving the quality of the gastric juice; or by producing a sedative effect upon the stomach. The chief of them include alkalies, viz., liquor potassæ, carbonate of soda or potash; mineral acids, especially hydrochloric or nitro-hydrochloric, and phosphoric; tincture or extract of nux vomica, or strychnia; cinchona or quinine, which, however, must be used with particular caution, as they are apt to disagree; vegetable bitters or aromatic bitters, viz., calumba, gentian, orange-peel, quassia, chiretta, cascarilla, chamomile, absinthe, and hop; aromatics and stimulants; carbonate or nitrate of bismuth. These can be variously combined, and among the most useful combinations may be mentioned an alkali with tincture or infusion of calumba or gentian; dilute hydrochloric acid with the same, or with orange-peel, to which tincture of nux vomica (♏v to x) may often be very advantageously added; bismuth with carbonate of soda and some bitter infusion. Hydrocyanic acid is in many cases a useful addition to these mixtures. In giving the vegetable bitters it is desirable to begin with a moderate dose, as they sometimes disagree at first. Medicines for promoting secretion are best given shortly before or during meals. Both acids and alkalies probably act in this way. Ipecacuanha, in doses of gr. ½ to i in pill, has been recommended for this purpose;

and also hot condiments and other stimulants. The last are useful in some cases, but the *habit* of taking these always before meals is decidedly to be deprecated.

When there are evidences of much gastric irritation, bismuth with alkalies, hydrocyanic acid, and sometimes morphia, are most beneficial as a rule, according to my experience. Sometimes, however, when the condition seems to be due to deficiency of secretion, mineral acids act well; and occasionally, even when there are distinct signs of subacute gastritis, I have known strychnine to be the only remedy affording relief. In cases of continued gastrorrhœa, some of the best medicines are oxide of zinc, oxide or nitrate of silver in minute doses, and vegetable astringents. Arsenic is also recommended. Opium or morphia is of great value in some morbid states, particularly in that which is due to chronic alcoholism. Dr. W. Fox has found the compound kino powder very useful in these cases. In that variety of indigestion, in which the food passes immediately out of the stomach, I have found most benefit from bismuth with a few minims of tincture of opium.

Important remedies are also employed as *substitutes for the gastric secretion*, viz., hydrochloric acid and pepsine, either separately or in combination. In some cases it is advisable to mix these with the food before it is taken, or they may be administered during meals. They aid also in preventing decomposition of food which is so apt to occur. Lactic acid has been likewise used for this purpose.

The drugs thus far considered are often of service in *cancer* and *chronic ulcer*, and may be tried, should symptoms seem to indicate a necessity for them. With regard to medicines which *directly promote the healing of an ulcer*, bismuth is supposed to act thus, given in gr. x doses every four or six hours, and also nitrate or oxide of silver; either of these may be combined with opium or morphia. There is no known remedy which has any influence upon cancer of the stomach.

4. *Symptomatic treatment* almost always demands attention in stomach complaints. The chief symptoms which call for interference are *pain*, *nausea* and *vomiting*, *heartburn*, *acidity*, *flatulence*, *eructations*, *pyrosis*, *constipation* or *diarrhœa*, or, in certain cases,

hæmatemesis or *perforation.* The treatment of most of these has already been fully considered. *Pain* may be relieved by opium, morphia, hydrocyanic acid, belladonna, conium, spirits of chloroform, or chloral internally: with *external applications* over the epigastrium, viz., dry or moist heat; cold in some cases, especially of cancer; anodyne fomentations; turpentine stupes; sinapisms; or, if the pain is continuous, a small blister, which may be dressed with morphia; or a belladonna or opium plaster. If the pain is severe, subcutaneous injection of morphia may be employed. Frequently it is associated with flatulence or acidity, and is then relieved by removing these conditions. *Flatulence* and *eructations* are usually much diminished by the use of the medicines already considered, which act upon the stomach and food. A combination of bismuth with freshly-prepared charcoal, given after meals, is efficacious in preventing the former; or such remedies as assafœtida, galbanum, musk, valerian, sumbul, spirits of ammonia, oil of rue or cajeput, and peppermint. Sometimes small doses of creasote, carbolic acid, sulpho-carbolates, or hyposulphites may be given with benefit. *Acidity* and *heartburn* are best relieved by a little carbonate of soda or potash, magnesia, or carbonate of magnesia. Frequent *acid eructations* are generally an indication for mineral acids, as they depend on fermentation of food from deficiency of gastric secretion. *Pyrosis* is usually checked by bismuth in full doses, with alkalies. Should there be habitual constipation, it is very important to avoid the constant employment of strong purgatives if possible. Vichy, Seltzer, and other mineral waters are often very serviceable.

5. It must not be forgotten that *the state of the general system* and that of *the main organs*, need due consideration in all cases of stomach disorder. Many of the remedies already alluded to act as general tonics, and thus aid in improving digestion. Among the conditions requiring particular notice are *anæmia*, which must be treated by mild ferruginous preparations; *hepatic derangements*, calling for an occasional dose of mercury or podophyllin; *gout, hysteria; malarial affections;* and *renal disease.* Gastralgia is usually much benefited by iron, strychnia, and various other nervine tonics.

6. With regard to those conditions in which the stomach is

much dilated, it has lately been recommended to use the stomach-pump systematically; and also to wash out the organ, using various injections, especially of an antiseptic character.

CHAPTER XXXIV.

INFLAMMATION OF THE INTESTINES—INTESTINAL OR ENTERIC CATARRH.—ENTERITIS.—DUODENITIS.—TYPHLITIS AND PERITYPHLITIS.

INFLAMMATION of the bowels presents considerable varieties as to the coats which are involved, and the extent of the intestinal tract which is implicated; hence the clinical history of this disease is anything but uniform. The term "enteritis" has been used very vaguely, and several distinct conditions have been included under it. It will be convenient briefly to consider in the present article all cases in which the intestines generally, or any portion of them, are inflamed, apart from special affections, such as dysentery or typhoid fever.

ETIOLOGY.—Little need be said on this part of the subject, as the causes are very similar to those which induce gastritis. *Enteric catarrh* is ordinarily due to some direct irritation by food, &c., or to a "cold." It also is frequently associated with various exanthemata and dentition. Irritant poisons give rise to more severe inflammation. A very intense form follows obstruction of the bowels; this sometimes results from ulceration, or from extension of peritonitis, and is said to occur in rare instances idiopathically. The local variety named "*typhlitis*," or *inflammation of the cæcum*, is generally due to the lodgment of hardened fæces or foreign bodies in this part of the intestine, or in the appendix vermiformis, which often ultimately leads to ulceration and perforation. *Duodenitis*, with ulceration, is peculiarly liable to be set up after burns and scalds. *Chronic intestinal catarrh* remains occasionally after an acute attack, but usually results from the repeated action of irritants, or is associated with ulceration, lardaceous disease, or other organic changes.

Anatomical Characters.—In the milder forms of catarrh, the appearances resemble those observed in other catarrhs, and need be no further described. The secretions are abundant and often very irritating, being sometimes mixed with blood. Superficial erosions or slight ulcerations are not uncommon. Occasionally a croupous or membranous deposit is observed over the surface, more or less extensively, this indicating greater intensity of the inflammatory process. If this is very violent, extending through the entire thickness of the gut, the color is extremely deep, sometimes purple or almost black, with spots of extravasation; all the coats are thickened and softened, generally infiltrated with serum, or occasionally with exudation or pus; while the intestinal contents are often mixed with blood. Gangrene occurs in some cases. The peritoneum may be involved by extension, exhibiting patches of lymph corresponding to the inflamed bowel.

In *simple catarrh* frequently the entire mucous tract is affected, the condition beginning above and extending throughout the intestines. It may, however, be limited. The more severe forms are confined, as a rule, to short portions, which are generally much distended, particularly when the inflammation depends upon obstruction, the part beyond being contracted.

In typhlitis, as previously stated, the cæcum or appendix becomes much inflamed from irritation, and this leads to ulceration and destruction of the coats, which is liable to end in rupture or perforation. As has been pointed out in a former chapter, the perforation may take place into the peritoneum, causing peritonitis; or into the surrounding cellular tissue, setting up inflammation there—*perityphlitis*—which usually terminates in the formation of an abscess, and this, if not opened, may burst in a variety of directions. Possibly perityphlitis may be excited independently of any actual perforation. The cause of the irritation is usually some foreign body or hardened fæces. In the appendix some small foreign substance which has gained an entrance becomes a nucleus, upon which fæces and secretions are deposited, forming concretions, which come to resemble fruit-stones, for which they have been mistaken. Of course it must be remembered that perforation may result from other forms of ulceration which are met with in the cæcum; from mere distension of this part of the intestine; or from its destruction by some extrinsic growth. The same course of events is now and then observed on the opposite side of the abdomen, in connection with the sigmoid flexure. A localized variety of inflammation has also been described in the colon (colitis), supposed to be distinct from dysentery, beginning in the submucous tissue, but soon producing extensive destruction of the mucous membrane.

When intestinal catarrh becomes chronic, there are the usual changes in color, which is often dark or even black from pigment; thickening and induration of tissues; with degenerative changes in the gland-structures. It may give rise to ulceration, or be associated with this or some other organic change in the bowel as an effect.

SYMPTOMS.—Cases of *simple enteric catarrh* are characterized generally by uneasiness over the abdomen, with colicky and griping pains, especially about the umbilicus, where there may be a little tenderness, through pressure sometimes gives relief; formation of much gas in the intestines, causing gurgling and borborygmi; diarrhœa, especially after taking anything, the stools becoming in some cases very numerous, being at first feculent, but soon of a watery, irritating character. These may be the only symptoms, but as the stomach is often implicated at the same time, this is indicated by a red, furred, and dryish tongue, impaired appetite, thirst, and a tendency to nausea or vomiting. In *duodenal catarrh* jaundice is frequently observed, owing to the closure of the common bile-duct by the swollen membrane; and if the duodenum is solely involved, there is localized pain and tenderness over it, with constipation instead of diarrhœa. Occipital headache is also said to be common. If diarrhœa has been severe for any time, the stools are apt to become somewhat dysenteric in character, containing mucus and blood, especially if the *large intestines* are mainly implicated, when there may be much tenesmus, and straining at stool.

The symptoms are proportionately more marked if the inflammation is considerable, especially the pain and tenderness, and they are particularly intense in connection with irritant poisoning. Should there be any membranous deposit upon the mucous surface, shreds, larger patches, or even intestinal casts of this material may be expelled in the stools.

As regards the *general symptoms*, in some cases there are none whatever, except, perhaps, some feeling of exhaustion from excessive diarrhœa. In the more severe forms, pyrexia is observed, with languor, general depression, and headache. In children there is frequently high fever, with much prostration, a greatly distended abdomen, and aphthous stomatitis. Sometimes convulsions or coma set in, and death may result in this way, or from exhaustion. In cases of poisoning, the general symptoms are grave, there being often a tendency to collapse; and the same thing is occasionally observed in severe enteric catarrh from other causes, especially in persons constitutionally weak, or who are suffering from some chronic disease.

The limited, intense form of inflammation, involving all the coats, has symptoms essentially distinct from those just described, and it is to this variety that many authors limit the term "enteritis." Here the affected portion of the intestine, which is at first the seat of spasm, soon becomes paralyzed, so that the contents cannot pass along, but accumulate in the part above. The symptoms are, at first, much localized pain, with tenderness, often referred to the umbilical region, increased by movement, along with general colicky pains and tormina; obstinate constipation; constant nausea and vomiting; thirst; a furred tongue; and pyrexia, preceded by rigors, the patient presenting a distressed and anxious expression. In a short time, if there is no relief, the abdomen swells from tympanitis, while the painful sensations subside more or less, in some cases completely; the vomiting gradually becomes stercoraceous, at last the materials coming up without any effort; the tongue is adynamic; and signs of collapse set in, with a pinched countenance, and extremely feeble and irregular pulse, the brain being either unaffected to the last, or death being preceded by low nervous symptoms. The urine is much diminished or suppressed. Hiccup is often a distressing symptom.

Typhlitis is generally indicated at the outset by pain and tenderness in the *right iliac fossa*, often severe, with, in some instances, *distinct physical signs of an accumulation in the cæcum,* and constipation, followed by mucous, or muco-purulent diarrhœa. Sudden perforation may take place into the peritoneum, without any previous serious symptoms. In other cases perityphlitis is set up, as evidenced by redness, firm swelling, œdema of the skin, increase of pain and tenderness, rigors, and pyrexia, followed usually by signs of the formation of an abscess, which may open in various directions, either externally or internally, sometimes thus setting up peritonitis. The pus is often fecal in odor, and may be mixed with actual fæces or gas. If the case is not speedily fatal, a permanent opening may remain, death occurring gradually by hectic; or ultimately recovery may ensue, with healing of the abscess. The same symptoms are rarely observed in connection with the sigmoid flexure, in the *left iliac fossa.*

Chronic intestinal catarrh frequently has no other symptom than chronic diarrhœa, the stools being liquid, pale, fermented, often very offensive, or lienteric, varying much in number and quantity. In many cases uneasy griping sensations and gurgling are experienced from time to time, or there may be some soreness over the abdomen. Stomach symptoms are generally present, and the tongue is often abnormal. Owing to the interference with digestion and nutrition more or less wasting is commonly observed, as well as slight pyrexia in some cases, especially towards evening.

DIAGNOSIS.—The chief affections for which the various forms of acute intestinal inflammation might be mistaken are simple diarrhœa, or diseases attended with this symptom, especially typhoid fever and dysentery; colic; peritonitis; painful affections of the abdominal walls; and, in the case of typhlitis and its consequences, local inflammation and abscesses in the right iliac fossa due to other causes, or certain tumors.

There can be no doubt but that many ordinary cases of diarrhœa are the result of catarrh, and it is often impossible to separate them. The characteristic symptoms of typhoid and dysentery are usually sufficiently distinctive. Simple colic is recognized by the characters of the pain, absence of fever, and presence of constipation. Peritonitis is readily separated from mere catarrhal inflammation by the severity of the pain and tenderness, constipation, great constitutional disturbance, and other symptoms; but as regards the intense localized variety of inflammation it is by no means easy to distinguish between them. Indeed, in most instances the peritoneum is involved along with the other coats, and this is more evident if the pain and tenderness are marked, superficial, and extensive. Colicky pains are suggestive of inflammation of the more internal portion of the walls. It is important to bear in mind duodenal catarrh as a not uncommon cause of jaundice.

In cases of chronic catarrh the main point to determine is whether this is simple, or whether it is associated with ulceration or amyloid degeneration. The special characters of ulceration will be presently indicated. Lardaceous disease of the bowels is almost always preceded by distinct clinical evidences of other organs being affected, as well as by the known causes of, and constitutional condition accompanying this morbid state.

PROGNOSIS.—Ordinary enteric catarrh usually ends favorably, but it may become chronic. If intense, however, or if it occurs in children, in very weak subjects, or as a complication of acute and chronic diseases, it may become highly dangerous and end fatally. The severe form of enteritis is extremely grave. Typhlitis is also necessarily attended with many dangers. Chronic catarrh, especially if long established, is often very difficult to cure, and it adds to the gravity of other chronic diseases by interfering with the nutrition of the patient.

TREATMENT.—The remarks made with respect to *diet* in the case of stomach disorders apply with almost equal force to those affecting the intestines. In general catarrh, if there is anything causing irritation it is useful to get rid of this by a dose of tincture of rhubarb, castor oil, or other simple aperient, or by an enema. As regards internal remedies, the most serviceable combination in my experience consists of bismuth, with alkalies, mucilage, and small doses of tincture of opium. An enema containing opium is also very useful when all irritant matters have been evacuated, and the various other remedies recommended for diarrhœa may be had recourse to if required. In duodenal catarrh it is necessary to give small doses of some saline aperient, such as sulphate with carbonate of magnesia, which may be preceded by a dose of calomel. External applications over the abdomen, especially heat and moisture, are often beneficial. Ordinarily there is certainly no necessity for removal of blood, but in the early stage of the severe kinds of inflammation it may be permissible to apply leeches, provided the patient is in a fit condition. When the inflammation is accompanied with obstruction, the main points in treatment are to *avoid giving powerful purgatives;* to *administer opium freely,* either by the mouth, enema, or subcutaneous injection of morphia; to *support the patient,* especially by enemata; and to *treat the prominent symptoms,* viz., pain, nausea, vomiting, tympanitis, &c., by the usual means.

Typhlitis and its consequences need *constant fomentation and poulticing,* perhaps a few leeches in some cases, and *opium* internally. If an abscess forms, it should be encouraged towards the surface, and opened when the proper time arrives. If an accumulation can be felt in the cæcum, it may sometimes be squeezed out by *gentle manipulation,* but much care is necessary in practicing this.

Chronic enteritis will probably require some of the more powerful astringents alluded to under diarrhœa. Powders containing ten grains of carbonate of bismuth and three to five grains of Dover's powder act very beneficially in some cases. Tincture of steel is also a valuable drug in this complaint when given in full doses. In obstinate cases, counter-irritation over some part of the abdomen, especially the right iliac fossa, by blisters, &c., has been recommended.

CHAPTER XXXV.

EPIDEMIC, ASIATIC, ALGID, OR MALIGNANT CHOLERA.—CHOLERA MORBUS.

ETIOLOGY.—Most of the etiological questions relating to cholera are very uncertain, and, although it should probably be classed with the acute specific diseases, it is more convenient to consider it here. This disease occurs chiefly as a virulent epidemic, exemplifying the ordinary laws very clearly. In some regions it is endemic. The *exciting cause* is presumed to be of a *specific* nature, and the favorite view is, that it is in the form of microscopic living organisms, either fungi or bacteria, which are contained in the stools. Organized particles and germs have been described by different observers as being found in the excreta and blood, to which they attribute the disease. At the present time elaborate investigations are being made by Lewis and Cunningham, in order, among other matters, to determine the nature of the cholera poison. Their researches thus far lead them to conclude that cholera is not due to fungus-germs or bacteria, and that there is no microscopically demonstrable poison. Though some do not believe in the infectious character of cholera, there is strong evidence to prove that it does spread from one human being to another by means of a contagious poison; and also that the stools are the main, if not the only, source of the contagion, this being conveyed either directly by attendants, by stained fomites, through the atmosphere, or by means of water. The absorption of the excreta by porous soils aids greatly in the propagation of the disease. Some believe that the poison multiplies in these after their discharge, and that they therefore become more virulent after a time, especially when mixed with water. At the same time unquestionably numerous cases occur in which it is impossible to trace any infection. Hence some regard the poison of cholera as having a malarial origin. Pettenkofer, who strongly opposes the infectious nature of cholera, believes that the germs of the disease can only develop and multiply in the subsoil water and not in the human body.

The immediate cause of an epidemic is usually quite obscure and inexplicable. At the same time there are certain meteorological and other conditions which predispose to its occurrence, and promote the spread and intensity of the disease, viz., a high temperature, with a moist, heavy, and stagnant atmosphere, cholera being therefore more prevalent in certain hot climates and at certain seasons; a low position of a district; unhealthy sanitary conditions, especially where the air is foul from overcrowding, want of proper ventilation, or the decomposition of organic matter, and where the water and food are impure and unhealthy. Cholera, however, is frequently observed under entirely opposite circumstances, and winds sometimes convey the disease to healthy districts. Many other conditions have been supposed to influence its occurrence, such as the nature of the soil, electrical state of the air, or the amount of ozone in it; but the statements on these matters are quite contradictory. It is found that most cases of cholera break out early in the morning.

Certain *individual predisposing causes* have been mentioned, but about many of these there is also much contradiction. Among the chief are fatigue, as after marching a long distance, destitution, errors in diet, abuse of purgatives, depressing mental influences, especially grief and fright, rather advanced age, race, intemperate habits, a bad state of health, occupation, which can only exert an indirect influence, recent arrival in an infected district. One attack does not afford protection against another.

ANATOMICAL CHARACTERS.—The morbid appearances met with in the majority of cases of death from cholera may be thus summarized: The temperature generally rises after death, and the body remains warm for some time. Rigor mortis sets in very speedily, there being often violent muscular contractions, displacing and distorting the limbs. The skin is mottled, more or less livid or blue, especially in dependent parts, and the limbs are shrunken, but these appearances are less marked than before death. Some of the most characteristic appearances depend upon the *distribution of the blood.* The left cavities of the heart are contracted and rigid, almost or quite empty, as well as the arteries; the right cavities are distended with blood, as are also the pulmonary artery and its divisions, and the systemic veins. *The capillaries of the lungs, however, and pulmonary veins contain little or no blood, and these organs are in a state of more or less collapse, in some cases being almost completely airless and bloodless.* Occasionally there is some hypostatic congestion. The organs generally are not congested, but shrunken and pale, their capillaries being empty, except in the case of the alimentary canal and kidneys, which are commonly more or less injected. The blood is frequently much altered in its physical and chemical characters, being thick, dark, and tarry-looking, becoming lighter on exposure. Most observers affirm that it is deficient in coagulability. Ecchymoses are sometimes seen under mucous and serous membranes; and the endocardium and serous fluids are often stained with hæmatin.

The stomach and small intestines generally present more or less injection of the mucous coat, with some swelling and œdema of that of the intestines, being also distended and containing a quantity of materials, in the main similar to those discharged during life. They differ, however, in containing *abundance of shed epithelium*, which is believed, therefore, to be detached after death. Sometimes there are masses of gelatinous or fibrinous matter, or much grumous blood. The glandular structures are commonly enlarged and prominent, especially Peyer's and the solitary glands, the latter rarely presenting ulceration. In exceptional cases a diphtheritic deposit has been observed. The large intestines are usually contracted, but do not exhibit any special characters. The bladder is contracted, sometimes extremely, and its epithelium, as well as that of the urinary passages and vagina, may be shed profusely.

In cases which survive into the *reaction-stage* there are more marked post-mortem appearances, indicating gastric and intestinal inflammation; acute Bright's disease; extreme congestion, low inflammation, or gangrene of the lungs; serous inflammations of a low type; and other complications to be hereafter mentioned, whilst those characteristic of cholera disappear more or less.

SYMPTOMS.—Cholera affords, in typical cases, a well-defined clinical history, which it is customary to divide into certain stages, the attack breaking out after an uncertain *period of incubation*, the duration of which may range, according to different observers, from one to eighteen days.

1. *Premonitory Stage.*—In many instances this stage does not exist, the disease manifesting itself suddenly in all its virulence. Diarrhœa is the most important premonitory symptom observed, which may or may not be attended with griping. Nervous disturbances have also been noticed sometimes, though many doubt their reality, such as a sense of languor, debility, exhaustion, or marked depression, trembling, altered expression of countenance, unaccountable lowness of spirits, headache, giddiness, noises in

the ears, epigastric uneasiness and oppression, &c. This stage does not last long as a rule.

2. *Evacuation Stage—Stage of Development.*—At this time the prominent symptoms are *severe purging* and *vomiting*, of special characters; *thirst; painful cramps;* with signs of *marked general disturbance*, in the direction of *prostration* and *collapse*. The *purging* is the first symptom, and it often sets in early in the morning, becoming speedily very frequent or almost constant. The stools are very profuse, watery, at first colored by the previous intestinal contents, but soon presenting peculiar characters, and being named "rice-water" stools, from their resemblance to water in which rice has been boiled. Then they are perfectly liquid, exceedingly pale, somewhat opalescent, or occasionally whitish or milky, with but little odor. On standing, more or less sediment falls, resembling flakes of boiled rice, leaving a whey-like fluid above, which has a specific gravity of from 1005 to 1010, and a neutral or slightly alkaline reaction. The quantity of deposit is actually very small, Dr. Parkes having found the amount deposited from a pint not to weigh when dried more than 4 grains. Chemically, the evacuations consist mainly of water holding in solution a considerable proportion of salts of soda and potash, especially chloride of sodium, with but very little albumen or other animal matter. The sediment has been supposed to be modified fibrin or mucus. Microscopically the objects which have been described are abundant granules; active, amœbiform particles of "bioplasm;" nuclei; round, nucleated, and granular cells, resembling pus or exudation-cells; peculiar hyaline cells; *only a few epithelium particles*; fungi, bacteria, vibrios; and occasionally triple phosphates. In exceptional cases blood is discharged, or its coloring matter. Often the diarrhœa is *painless*, but there may be griping. *Vomiting* comes on later, and is less severe and profuse, occurring chiefly after anything is taken. The vomited matters soon consist of a clear, or yellow thin fluid. The *cramps* usually set in with the rice-water stools, affecting mainly the fingers and toes, calves of the legs, and thighs, but sometimes the abdominal muscles. *Thirst* soon becomes a prominent and constant symptom.

In proportion to the severity of the purging and vomiting, a sense of exhaustion is felt, and signs of depression and collapse appear, culminating, if the symptoms do not subside, in those characteristic of the next stage, under which they may be more conveniently described.

3. *Stage of Collapse—Algid Stage.*—There is no abrupt commencement of this stage, but a more or less rapid transition from the former. The aspect of the patient becomes highly characteristic. The features are pinched and shrunken, assuming a leaden or livid hue, especially about the lips; the eyeballs sink in their sockets, while the lower eyelids fall and the eyes are half closed; the nose is sharp and pointed, and the cheeks are hollowed. The entire surface is more or less cyanotic, especially that of the extremities, while the skin presents a peculiar wrinkled and shrivelled aspect, being often at the same time bathed in cold sweats, the hands appearing sodden, like those of a washerwoman. When pinched up, the folds disappear slowly. The temperature rapidly falls, and the surface soon has a deathlike coldness, particularly over exposed parts, though it is stated that the temperature *within the body* is usually increased. In the mouth it ranges from 79° to 88°, in the axilla from 90° to 97° (Goodeve). In the vagina and rectum it is considerably higher. The circulatory organs and blood give evidences of grave disturbance. Not only is the radial pulse exceedingly feeble and thready, or even extinct, but in bad cases no pulsation can be felt in the brachial, or even in the carotid artery, while the cardiac impulse and sounds become extremely weak or almost imperceptible. The general capillary circulation is seriously embarrassed. When a vein is opened, little or no blood escapes, this being thick, viscid, and tar-like. The respiratory functions are also impeded. There is paroxysmal dyspnœa, with gasping for breath, sense of oppression and craving for air, at last almost continuous. The expired air is cold, and very deficient in carbonic anhydride. The voice is extremely weak, often whispering or entirely inaudible. The nervous system necessarily suffers severely. As a rule muscular prostration is marked, but the strength is now and then wonderfully retained. There is great restlessness and jactitation, with wakefulness, the patient tossing about and throwing off the bed-clothes. At first much anxiety is felt, but this soon changes into apathy and indifference. Occasionally headache, giddiness, tin-

nitus aurium, muscæ volitantes, or cloudiness of vision are complained of. The mind is at first clear, though inactive, but in cases ending fatally stupor sets in, followed by coma. Reflex excitability is markedly impaired. Cramps continue from time to time.

A prominent feature of this stage is the diminution or complete cessation of the functions of absorption and secretion. No saliva is formed; while the urine is almost entirely or quite suppressed. At this time the purging and vomiting diminish in amount and frequency, though there may be much retching; the stools are less liquid usually, and contain mucus or gelatinous masses; they are often passed in bed. Ultimately they may become extremely offensive, resembling decomposed fish. Intense thirst is experienced, with a sense of heat in the epigastrium, the patient constantly craving for cold drinks, which are swallowed with spasmodic avidity, probably to be immediately rejected. The tongue feels cold.

The intensity of the symptoms described varies much; when they are developed in their full severity recovery seldom takes place, death occurring more or less speedily, preceded by signs of more and more interference with the respiratory functions, increased capillary stagnation, and coma. In most cases the temperature rises with the approach of death. In the less marked cases, however, recovery follows not unfrequently, and there is no condition which is utterly hopeless. The phenomena attending restoration will be now considered.

4. *Stage of Reaction.*—The signs indicating restoration are a gradual change in the expression, general aspect, and color; improvement in the pulse and cardiac action, with diminution in the capillary stasis, and return of heat to the surface, the respiration becoming at the same time more regular and calm, while the restlessness, thirst, and other symptoms diminish, and the secretions are re-established. The patient often falls into a calm doze, vomiting ceases, but a little purging may continue, the stools, however, containing bile. There is said to be no actual rise of temperature at the beginning of reaction, but a cooling of the interior parts of the body, while the outer parts warm up (Jüterbogk). This stage may terminate in speedy convalescence, but this is often not the case, certain *complications* or *sequelæ* being very liable to hap-

pen, or now and then a *relapse* taking place, which may prove fatal. Occasionally also the reaction is imperfect, and the symptoms continue more or less, there being no pyrexia, the patient dying in a few days, or sinking into a typhoid state, or ultimately recovering.

A most important matter during the progress of convalescence is to look for the restoration of the secretions, especially the urine. The temperature not unfrequently rises above the normal, without any obvious cause.

COMPLICATIONS AND SEQUELÆ.—Among the slighter deviations mentioned by Dr. Goodeve are *mild consecutive fever*, with general disturbance, which may assume a remittent or intermittent type, usually ending in recovery in a few days; *obstinate vomiting*, often associated with more or less gastritis, which may become very serious; *frequent hiccup*, with gaseous eructations and loss of appetite; and *want of sleep*. The more grave complications usually met with are *acute desquamative nephritis*, with *uræmia*, which may possibly become *chronic;* "*cholera typhoid;*" severe *enteritis*, which may be of a *diphtheritic* character; *chronic diarrhœa* or *dysentery; low pneumonia* or *pleurisy*. The urine is usually albuminous, and may contain some hyaline casts during convalescence, but in favorable cases it soon becomes normal. In some instances, however, it assumes the characters indicating acute renal disease, along with the other symptoms of this condition, and signs of uræmia. The term "cholera typhoid" has been used vaguely; the symptoms are merely those pertaining to the "typhoid state" generally, and they may be associated with uræmia, with any adynamic inflammation, or be independent of visible morbid changes, being then probably due to blood-poisoning.

A *cholera-eruption* or *exanthem* has been described, but though erythematous, maculated, papular, urticarial, or even purpuric eruptions appear in some instances, there is none characteristic of cholera, and Niemeyer states that they are chiefly observed where sinapisms have been freely applied, or friction energetically employed. Should there be any inflammatory complication, the temperature rises as a natural consequence.

As occasional sequelæ are mentioned inflammation of the genitals, parotid bubo, ulceration of the cornea and its consequences, gangrene of various parts, bed-sores, boils, ulcers, &c. In many cases, especially if prolonged, a condition of marked debility and anæmia is left behind.

VARIETIES.—In some cases the collapse stage sets in with little or no previous purging or vomiting, death ensuing very speedily. On the other hand this stage may be imperfectly developed. During an epidemic of cholera numerous cases of diarrhœa are met with, lasting several days, generally painless, to which the terms "choleraic diarrhœa," or "cholerine,"* are applied. The stools are usually pale, liquid, and copious, and there may be vomiting, cramps, with a sense of exhaustion and illness. These cases have been regarded as the result of a milder dose of the cholera poison, and they may pass into true cholera, though sometimes they prove fatal without this. Towards the end of some epidemics the choleraic diarrhœa passes into a kind of low fever.

As regards cases of so-called *sporadic*, *bilious*, or *English cholera*, or *summer diarrhœa*, it is sometimes almost impossible to determine whether they differ from true cholera or not, though they are usually considered as being distinct. The symptoms may be exactly similar, and such a case would be recognized as one of cholera if occurring during an epidemic; but ordinarily they are less severe, and the differences are said to be that the stools and vomited matters contain bile, there is more griping, urine is not entirely suppressed, and the duration is longer, while the mortality is much less (Goodeve). Some cause can generally be found for the attack.

A *sthenic* variety of cholera has been described, attended with much fever in the early stages, and violent painful spasms.

PATHOLOGY.—All authorities seem agreed that cholera is primarily due to the action of some specific morbid poison upon the system, at present of doubtful nature. Beyond this point, however, there is a wide and important divergence of opinion. Dr. G. Johnson and others consider *that all the phenomena of cholera*

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* The term "cholerine" has also been applied by Dr. W. Farr to the *poison which originates cholera.*

are due to this poison, which acts first on the blood, in which it is enormously multiplied, and then affects certain portions of the nervous system, especially the sympathetic and the nerve centres influencing the respiratory and circulatory organs, thus leading to paralysis of the coats of the intestinal smaller arteries and capillaries, with consequent free transudation, while the small vessels of the lungs are spasmodically contracted, and will not allow the blood to pass through. According to this view the purging and vomiting are regarded as *eliminatory* of a morbid poison. Another class of pathologists believe that the cholera-poison acts directly on the alimentary canal, and that the subsequent phenomena of collapse are *the consequence* of the intestinal disease, and of the violent purging and vomiting, being due to the *physical changes in the blood* and *disturbance of the sympathetic nerve* thus induced. The blood does undergo some very marked alterations. As already stated, it becomes very thick and dark. Water is rapidly withdrawn, both from the liquor sanguinis and the corpuscles, and hence a serious disturbance in the relations of these to each other arises. Soon also the proportion of saline ingredients is much diminished, while that of the organic elements is relatively increassd, especially the corpuscles and albumen. The specific gravity is considerably raised. Occasionally the blood is acid. During the collapse stage it may contain urea and other products of decomposition, some of which may result from changes in the stagnant blood itself. In the reaction stage these are often very abundant. Drs. Lewis and Cunningham have recently described peculiar microscopic changes observed in choleraic blood removed during life, as well as in that obtained after death, viz., the rapid development and multiplication of active bioplastic bodies, ultimately forming cells, and they consider that these changes may go on in the body, and that this may account for the abundant bioplasts and cells found in the cholera evacuations. The alterations in the blood will explain the thirst, the drying up and shrivelling of the tissues, and also, to a great degree, the capillary stagnation, disturbance of the respiratory and circulatory functions, and suppression of secretions. At the same time these effects are partly to be accounted for by the influence exerted upon the heart through the sympathetic, the feeble action of this organ aiding in producing many of the symptoms, because it cannot drive the blood through the vessels. The dyspnœa is also partly accounted for by the pulmonary collapse. The cyanotic appearance is partly due to the stagnation of blood, partly to its concentrated and venous character.

It is important to note that the fact of purging ceasing during the collapse period does not imply always that transudation of fluid is not going on, for at this time the intestines are often paralyzed, and they may contain a large quantity of fluid which they are unable to expel.

The events which occur during the reaction stage are due chiefly to the impurities which accumulate in the blood, and they are more liable to arise in proportion to the duration of the collapse stage, and to the length of time which elapses before secretion is properly set up after reaction has commenced. They are probably promoted by improper employment of stimulants and drugs.

DIAGNOSIS.—In the early stages it may be difficult to distinguish cholera from diarrhœa due to other causes, especially English cholera. The main circumstances in favor of cholera are its being epidemic, and there being no other obvious cause of the attack, which comes on early in the morning, and is attended with little or no pain, the stools becoming very pale, liquid, and abundant, soon accompanied with vomiting and severe cramps, with rapid tendency to prostration and collapse. *In any doubtful case, it is safer to consider it as one of cholera. The appearance of the face* may give indications of the nature of the disease before any complaint is made. In a well-marked example of cholera the symptoms are soon but too characteristic. It must be borne in mind that this disease has set in so violently, and under such circumstances as to simulate irritant poisoning, and on the other hand, poisoning has been mistaken for cholera. The collapse due to perforation of a gastric or duodenal ulcer has also been thus mistaken.

PROGNOSIS—MORTALITY—DURATION.—It need scarcely be remarked that the prognosis in cholera is always grave. The mortality varies in different epidemics, ranging from 20 or 30 to 70 or 80 per cent.; it is higher in the early part of an epidemic.

As a rule more than half the cases recover. The chief general circumstances rendering the prognosis worse are infirmity and old age; unfavorable hygienic conditions; previous intemperance; debility from any cause; the existence of renal disease. During the actual attack the prognosis, both immediate and remote, is more grave in proportion to the rapidity with which collapse comes on, to its profoundness and duration. Rapid disappearance of the pulse from the larger arteries, with great disturbance of the respiratory functions, intense lowering of the temperature, marked cyanosis, or tendency to coma, are very bad signs. The cessation of purging is sometimes unfavorable, indicating paralysis of the intestines. When reaction sets in there are many dangers to be feared, but a more favorable progress to convalescence is to be expected in proportion to the rapidity with which the functions of secretion and absorption are re-established, and to the continuous and regular improvement in the symptoms. Most of the subsequent complications are exceedingly serious.

The *duration* of cases of cholera may range from a couple of hours to some weeks, reckoning in its sequelæ. The average duration of fatal cases is about from two to three days. The length of the stages varies considerably.

TREATMENT.—Unfortunately in many cases of cholera no treatment is of any avail. In others, however, much may be done particularly in the early period of the disease; and still more can be accomplished in the way of prevention. Without entering into details, it will be sufficient to state here that *all the rules* laid down in a former chapter as to the management of contagious diseases and epidemics, *must be rigidly carried out*, under the *personal superintendence* of competent individuals. Particular attention is demanded with regard to the *choleraic stools*, which should be *immediately disinfected;* and also with regard to sewers, drainage, &c. Persons should be warned against errors in diet, intemperance, and other injurious influences, and everything must be done to calm the minds of the people and prevent needless fear and depression. During epidemics it is very properly the custom to organize staffs of medical men and their assistants, in order to carry out thoroughly all the necessary preventive measures, and to treat cases as soon as they arise, house to house visitation being practiced daily. If possible, it is highly desirable for persons to remove from infected districts.

In the management of an individual case it is extremely important *to avoid any routine plan,* and to be guided as to the measures to be employed by the actual condition of the patient and the stage of the disease. *Personal attention* on the part of the medical man is also generally needed, so far as is practicable, in order to see that the treatment is properly carried out. The earlier this is commenced the more likely is it to be successful, and patients *should take to their bed at once.* During a cholera epidemic *the slightest case of diarrhœa ought to receive the most prompt attention,* and the public should be instructed on this point, and places established where they may at once obtain the necessary medicines.

In the *evacuation stage,* two directly contrary plans of treatment are employed, most practitioners using measures for *checking the diarrhœa,* some *encouraging it,* acting on the principle that it is *eliminatory* of a poison. Dr. G. Johnson gives *castor oil* at frequent intervals. Others have advocated the use of calomel, sulphate of magnesia, &c. Undoubtedly in some cases of *early choleraic diarrhœa* a dose of castor oil is beneficial, with the view of getting rid of irritant matters; but, apart from all theoretical considerations, experience has proved that this plan of treatment, employed systematically, is by no means favorable. Most decidedly *the evacuations ought to be checked as soon as possible,* in my opinion. *Opium* is the great remedy for this purpose, the best preparations being the pill, tincture, or Dover's powder. This drug, however, requires much care in its administration in cholera. Should there be signs that the collapse stage is approaching, particular caution is necessary in giving opium, and it is inadmissible if this has become established. If the conditions are favorable, it seems best to give a *full dose* at once, and then repeat it in smaller quantities as it is needed. Should the first dose be vomited, it may be repeated after a short interval. It is better to give the opium alone, and use other remedies between times, if required. Various astringents are useful, especially acetate of lead, tannic or gallic acid, in considerable doses. It appears probable, from the experience of some cases, that the encouragement of *very free sweating* at the *commencement of* cholera may be beneficial.

In the *collapse stage opium must on no account be given*, and the most reliable treatment at this time is by the *judicious use of stimulants*. Before there are indications that collapse is setting in these are not called for, but as soon as any weakness of the pulse is observed, or other signs of sinking, they should be commenced. The practice of pouring in large quantities of stimulants is to be highly deprecated, and their administration needs the most careful regulation. The best alcoholic stimulants are brandy with iced water, and champagne. They must be given in *small quantities*, at more or less frequent intervals, according to circumstances; and it is their influence upon the pulse which must mainly guide their administration. Diffusible stimulants are also of service, viz., spirits, solution, or carbonate of ammonia; ether; camphor (which at one time was vaunted as a specific); musk; with essential oils of peppermint, cinnamon, cajeput, &c. These, however, must be given with equal caution. Niemeyer found a few cups of hot strong coffee useful in some cases. He also recommended the application of cold compresses over the abdomen in collapse.

With regard to *diet*, it is useless to give any nourishment at first, as this is only rejected immediately. A little beef tea, chicken broth, or arrowroot and milk, may be tried later on, if the vomiting ceases. Iced water should be allowed throughout, in small quantities, though during collapse a good deal may be permitted; fragments of ice may also be sucked. Enemata of iced water, or, on the other hand, of warm milk, have been recommended.

Various *symptoms* call for attention usually in the course of a case of cholera. These must be treated on ordinary principles, and it can only be mentioned here that obstinate vomiting is generally best relieved by the application of sinapisms to the epigastrium, or by subcutaneous injection of morphia; cramps by heat, sinapisms, friction with turpentine or chloroform, or, if very severe, by inhalation of chloroform.

Should *reaction* set in the utmost care must be exercised, especially as regards diet, and against undue interference with the natural progress towards convalescence, by needless medication. Only the blandest liquid food should be given, in regulated quantities, and this matter of diet must be strictly attended to until the patient has quite recovered, it being improved by degrees as the stools become natural. Water may be freely allowed at this time, and it has been recommended to dissolve some salt and carbonate of soda in it, in order to replace the large amount of these salts which has been lost. It is highly important to watch for the re-establishment of the secretions, and, if necessary, measures may be adopted to encourage this. Complications and sequelæ must be treated as they arise. It need only be mentioned here that it is not always desirable to check diarrhœa at this time, should the stools be very offensive; and that inflammations require a supporting treatment. Tonics and iron are often serviceable during convalescence, in order to remove anæmia and debility.

Among general matters requiring notice are strict attention to cleanliness and ventilation; the immediate removal of wet and soiled bedclothes, it being well to have a mackintosh under the patient; due precautions against bed-sores by frequent examination; and the proper emptying of the bladder should the urine be retained, which is sometimes the case, when it might be presumed to be suppressed.

For such a disease as cholera it is not to be wondered at that innumerable *specific* modes of treatment have been advocated, but all have proved equally inefficient. Without making any comment, I merely mention some of the most prominent: viz., the administration of saline salts, chiefly carbonates and chlorides, either freely by the mouth, by enema, or *by injection of a warm solution into the veins;* the use of warm, vapor, or hot-air baths, or of the wet sheet; application of ice to the spine; the employment of antiseptics, such as carbolic acid, sulphocarbolates, chloralum, &c.; inhalation of oxygen; inhalation of nitrite of amyl; calomel, in 1 or 2 grain doses, at frequent intervals; bisulphide of mercury. The various cholera drops and pills which are used in different countries are made up of stimulants, generally combined with some preparation of opium.

DYSENTERY—BLOODY FLUX.

ETIOLOGY.—Dysentery occurs as an acute and chronic disease, and may be sporadic or epidemic. Different views are held as to its immediate *exciting cause*, viz., 1. That it is due to a *malarial poison*, originating in vegetable decomposition, and rising from the soil. 2. That though primarily originating in this manner, it may be afterwards propagated from one individual to another by means of a *contagious specific poison*, conveyed, as some suppose, only by the evacuations, especially through their infecting drinking-water; or, as others believe, by all the excretions and exhalations. 3. That it *is independent of any specific poison*, and merely results from certain general causes, which tend to produce intestinal congestion and inflammation, such as exposure to cold, especially to night chills and dews; errors in diet, especially want, or improper quality of food; excessive use of salt meat; drinking impure water or irritating liquors; indulgence in excess of or in sour fruit, &c. Those who regard the malady as *specific* consider the causes just mentioned as merely *predisposing*, or as aiding in propagating the poison, but it is highly probable that they may at all events excite the sporadic form. Amongst other *predisposing* and *propagating causes* are a hot and moist climate, especially during the seasons when the nights become chilly, most cases occurring in the autumn, and particularly after much exposure to night air; overcrowding and filth; bad ventilation, especially exposure to emanations from any kind of decomposing organic matter; physical exhaustion, &c. It may accompany or follow certain diseases, particularly ague or remittent fever, scurvy, cholera, syphilis, and the state of system resulting from the action of prolonged heat. Ague and chronic dysentery were not uncommonly met with together in the case of sailors admitted into the Liverpool Northern Hospital, and occasionally it accompanied scurvy. As a *chronic* complaint dysentery always has its origin in the *acute* form.

ANATOMICAL CHARACTERS AND PATHOLOGY.—In general terms dysentery may be said to be characterized by inflammation of the large intestines, ending in ulceration or gangrene, with exudation on the surface. According to the view entertained as to the origin of the disease, is the inflammation considered by different authorities as *simple* or *specific*. Niemeyer regarded it as *diphtheritic*. So diverse have been the descriptions given of the morbid appearances, that it has been found necessary to start theories as to difference of type, &c., in order to explain the want of agreement, and it seems highly probable that the constitutional state of the patient will materially influence the characters of the disease.

Usually only a portion of the large bowel is involved, especially the rectum and neighboring part of the colon; sometimes the entire tract is affected, but the disease is then generally more advanced towards the end of the intestines. Occasionally it extends to the small intestines, even for a considerable distance up, but this is seen usually only in scorbutic cases, or when patients are much debilitated.

In the early stages the chief appearances are considerable enlargement of the solitary glands (which has been regarded by most authorities as the primary lesion), and of the tubular glands; increased vascularization, varying much in extent and intensity, but being especially marked around the glands; with some swelling and softening of the mucous membrane. The solitary glands form little rounded projections, and in many, a minute spot can be detected, corresponding to the orifice. They are filled with a whitish exudation, containing abundant young cells. Some consider these prominences as at all events partly due to exudation accumulating apart from the glands, and that these are not *specially* involved in dysentery. An exudation also forms in the intertubular tissues, and on the surface of the mucous membrane, of a diphtheritic nature. It covers the membrane more or less extensively and thickly, sometimes being uniform, but usually granular, often presenting an appearance like bran or sawdust, and being most abundant on the tops of mucous folds. At first the color is grayish or yellowish-gray, but this is soon liable to many alterations from various causes. The material is opaque, of some consistence, and can be detached, leaving a more or less red surface underneath, or signs of extravasation of blood. It appears to consist of a fibrinous substance, with abundant granules, nuclei, and germs, epithelium cells, and young nucleated cells, some of which are elongated and fusiform, resulting mainly from proliferation. Occasionally it undergoes a process of partial organization.

Ulceration appears chiefly to begin in connection with the enlarged glands, by a process of limited sloughing at the summit, the ulcer afterwards spreading. Sometimes, however, several glands with the intervening tissue are destroyed simultaneously; or the ulceration appears to be due occasionally to a process of disintegration in the exudation, involving at the same time the superficial part of the membrane. Very rarely it originates in submucous accumulation of pus or other materials. At the outset most of the ulcers are small, circular, with rounded edges, but not all; by extension they become larger and irregular, often having a transverse direction, the margins being flattened, and the depth and appearance of the surface varying greatly, so that in time the ulcers are altogether wanting in uniformity. Not unfrequently the floor becomes covered with exudation. Now and then the coats are rapidly destroyed, so as to lead to perforation. Should the case be favorable, and *cicatrization* ensue, this generally takes place with little or no puckering, the edges becoming rounded, adhering to the base of the ulcer, a layer of lymph then extending over the surface and becoming organized. Now and then healing is attended with much thickening, irregularity, induration, and contraction, leading to serious results. There is no fresh formation of glands in the cicatrix.

The rapidity with which the changes described occur in the course of a case of dysentery differs much. In very severe cases the entire mucous membrane of the large intestine is speedily converted into a slough. The affected part is generally dilated, and contains very offensive materials, similar to those passed in the stools, including fragments of exudation and often blood.

When the small intestines are implicated, the appearances which may be met with are redness; exudation on the surface, sometimes extensive; enlargement of Peyer's and the solitary glands, or, rarely, ulceration of these. The stomach may present signs of more or less gastritis. The other morbid conditions which may be observed in different cases associated with dysentery are enlargement, redness, and softening of the mesocolic glands, and, in some forms, of the mesenteric; serous inflammations, especially of the peritoneum, corresponding to the affected part of the bowel, or due to perforation; hepatic derangements, particularly *inflammation ending in abscess;* enlargement of the pancreas and spleen, the latter being rarely the seat of abscess; renal disease, with destruction of the epithelium; extensive bronchitis, lobular pneumonia, or pyæmic abscesses. With respect to the relation of hepatic abscess to dysentery, there is much difference of opinion. Some regard them as *mere effects of the same cause*, being independent of each other; others think the *abscess is the consequence of the dysenteric ulceration*, being produced by an extension of phlebitis, or, more probably, by the conveying of emboli and other deleterious substances. This complication seems to be much more common in hot climates.

When dysentery becomes *chronic*, the appearances are very diverse. Usually firm exudation forms between the coats, matting them together, and causing much thickening and induration, so that the intestines feel very firm and solid, pieces sometimes standing on end. The color of the mucous surface alters, becoming dirty, brownish-gray, or in parts black, from pigment derived from altered blood. The exudation undergoes a certain degree of organization, and forms often thick, warty, adherent masses. The surface has in some cases a bark-like aspect. Frequently, but by no means always, ulcers are observed, in every conceivable variety of stage and character, as well as cicatrices of former ulcers; some of these result from changes set up in the exudation, which extend into the tissue beneath. In some cases cicatricial bands and contractions alter greatly the calibre and form of the bowel, and sinuses may pervade its walls. In other instances there is extreme atrophy of the coats, including the glandular structures. An appearance of pseudo-ulceration may result from separation of the firm exudation, or cracking of this, exposing the mucous surface, which is extremely red and irritable-looking.

Symptoms.—*Acute dysentery* is presented in all grades of intensity, from a mild sporadic form to an epidemic of the most virulent type, but its symptoms are generally highly characteristic. Many cases, especially in temperate climates, begin with simple diarrhœa, slight colicky pains, thirst, loss of appetite, and some constitutional disturbance, the special symptoms setting in after a short interval; sometimes these are observed from the outset. A chill or rigor commonly ushers in the disease in severe cases.

The prominent local symptoms are *griping pains* in the abdomen, named *tormina*, irregular in site, but chiefly felt along the colon; often a sense of *heat* or *burning* along the colon and rectum, or, in grave cases, over the whole abdomen; *tenderness*, especially in the left iliac fossa; more or less tympanitis; *tenesmus*, indicated by a sensation of fulness, weight, bearing-down, or of the presence of a foreign body about the lower end of the rectum, with frequent or constant desire to defecate, the act being accompanied with much straining; and the passage of *peculiar stools*. The morbid sensations differ greatly in their severity and constancy; in most cases they are paroxysmal, increasing until a stool is passed, by which they are temporarily relieved; sometimes, however, they become constant and most agonizing. The tenesmus is more marked when the lower portion of the rectum is implicated. At first the stools are often semifeculent, or consist of hard scybalæ, but they soon assume the dysenteric characters, becoming *scanty*, *slimy*, or *gelatinous*, from the presence of mucus, *bloody*, with a most *offensive* and *characteristic odor*. Usually the different matters are more or less mixed, the more so the higher the disease, when they also contain abundant depraved biliary secretions. If the rectum is chiefly affected, the blood is less intimately incorporated, while the stools are more muciform (Maclean). Not uncommonly scybalæ are passed from time to time, covered with mucus and blood. Mild cases do not go beyond this, but in bad cases in tropical countries, the stools change in their characters, becoming muddy-looking, brownish, brownish-red, or even black, often watery and copious, and containin shreds or masses of membrane, which look like "washed ra meat." Sometimes a large quantity of pure blood is passed, sloughs of the mucous membrane. At this time the odor becom intolerable, and it has been compared to carrion, or to the "sm of a macerating tub in the dissecting-room." Dr. Goodeve recommended that the stools should be washed with water, s to leave nothing behind but the sediment, which contains the p ucts of the intestinal disease, and these can be then examined, and the condition of the bowel be thus more accurately determined. Chemically the stools yield a large proportion of albumen, even when there is little or no visible blood. They are alkaline, and contain much carbonate of ammonia. Microscopically they present abundant epithelium-cells, blood, exudation- and pus-cells, and remnants of the membrane. Peculiar cells and other bodies have been described.

There are other indications of digestive disturbances, in the way of anorexia, thirst, which may be intense, furred tongue, and sometimes nausea and vomiting. There may be irritability of the bladder, with strangury, or, on the other hand, paralysis with retention, when the rectum is much affected. The urine is generally high-colored, scanty, and prone to rapid decomposition. In low forms it is very offensive; occasionally it is suppressed. In females irritation of the vagina is complained of in some cases.

The *constitutional symptoms* in the less severe cases are only those of slight pyrexia. In the graver forms these are more marked, there being at the same time much nervous depression and irritability, with an anxious, distressed expression of countenance. When tending towards a fatal issue, and in the most severe types of the disease almost from the first, the symptoms assume an adynamic or typhoid character, with great prostration, the tongue becoming red, dry, brown or blackish, with sordes on the teeth, the pulse very rapid, feeble, or irregular, while the tympanites increase, the painful sensations cease, there is persistent hiccup, and low nervous symptoms set in, ending in coma. In the malignant type of the disease speedy collapse occurs, resembling that of cholera, with hemorrhage from the mouth and nose.

Several *varieties* of acute dysentery have been described, according to the severity and nature of the symptoms present, and the other conditions with which it is associated. The chief are named *mild; sthenic; asthenic;* or *typhoid; bilious; malarious,* characterized by the periodicity of the febrile paroxysms; much gastric irritability; the serous character of the stools from the first, which contain but little blood; the greater frequency of hepatic complications; and the efficiency of quinine in treatment (Maclean); *malignant; scorbutic.*

Dysentery lasts a very variable time, and it may terminate in death or recovery, or become chronic. Death may end a case within two days, or not for two or three weeks, or more; it results either from collapse, the typhoid state, gradual exhaustion in prolonged cases, hemorrhage, or occasionally perforation. Recovery is indicated by the stools becoming feculent, and losing their dysenteric characters, along with cessation of the painful sensations, diminution of fever, and improvement in strength, in the state of the pulse, and in the expression.

Chronic dysentery is a most unpleasant complaint, but the precise symptoms will depend not only upon the state of the bowels, but they are also modified often by some constitutional diathesis, or by a diseased condition of some other organ. The tenesmus and other morbid sensations are less marked, or may be absent. In some cases the power over the sphincter becomes completely lost. The stools differ considerably in characters, even in the same case from time to time; they may be formed, but covered with mucus or blood; usually, however, they are more or less liquid, presenting a mucous, serous, or bloody appearance, mixed with fæces; sometimes they are reddish-brown, or pale and frothy muco-purulent, or actually purulent. The peculiar odor is retained more or less, and may be very intense. Appetite varies much; the tongue is often red, glazed, or fissured. The general system necessarily suffers considerably, as evidenced by emaciation, anæmia, or a sallow and cachectic aspect, shrunken features, with a distressed, weary, or aged expression, sense of weakness and exhaustion, pyrexia, tending towards the hectic type, with night sweats, loss of hair, ending often in gradual death from asthenia.

DIAGNOSIS.—The symptoms of dysentery described are quite characteristic, and *an examination of the stools*, combined with the sensations felt and the general symptoms, ought to leave no doubt as to the nature of the case. All authorities lay much stress on the *peculiar odor* of the evacuations. The fact of the disease being epidemic is also of service in diagnosis.

PROGNOSIS.—This will depend upon whether the disease is sporadic or epidemic; the severity of the attack; the characters of the stools; the general condition of the patient; the progress of the case; and the presence or absence of serious complications, especially hepatic. Epidemic dysentery, particularly when of a low type, is extremely fatal. Signs of collapse or adynamia are of course very unfavorable, and among specially bad signs may be mentioned gangrenous stools, severe hemorrhage, subsidence of the pain while the other symptoms are getting worse, and suppression of urine. An early return of the evacuations to their normal state is highly favorable. Chronic dysentery may often be improved by appropriate management, as I found from a tolerably extensive experience of this disease at the Liverpool Northern Hospital. Prolonged cases, however, are not much amenable to any treatment.

TREATMENT.—The importance of *early* attention is as great in acute dysentery as in cholera, and the patient should *immediately take to bed.* In the sporadic form, resulting from a chill, some authorities advocate the use of a warm, vapor, or hot-air bath at the outset. In some cases also a little castor oil with laudanum is beneficial at first. *The remedy,* however, in this disease, and one which seems to have almost a *specific* action, is *ipecacuanha* in full doses. Several gentlemen who have had much experience of dysentery in India, have personally informed me of the marvellous effects of this drug. Dr. Maclean recommends the following plan of administration: To give gr. 25 to 30 of the powder in a *small* quantity of fluid, with a little syrup of orange-peel, after which the patient must keep perfectly quiet, and take no fluid for at least three hours; if thirsty, being allowed to suck a little ice occasionally. In from eight to ten hours a smaller dose may be given, this depending on the effect of the first, and the urgency of the symptoms, by which also the subsequent repetition of the drug must be guided, and it may be required for some days. It is well to administer 10 or 12 grains at bedtime for a night or two after the stools appear healthy. Some authorities recommend it to be administered more frequently, in smaller quantities; and others employ ʒ½ to ʒj every four or five hours, but these large doses seem unnecessary, and are liable to produce much depression. It has also been advocated to introduce it by enema, but this is objectionable. Many consider it desirable to make the stomach tolerant of the medicine beforehand, by means of a full dose of laudanum or Battley's solution, or a few drops of chloroform; or by applying anodyne poultices over the epigastrium. Perhaps a small subcutaneous injection of morphia might answer this purpose. Dr. Maclean states, however, that frequently no sedative is required, and that if vomiting is unmanageable after ipecacuanha, hepatic complication or overcharging of the system with malaria should be suspected.

Local applications over the abdomen are very useful, especially warm poultices, fomentations sprinkled with turpentine, laudanum, or chloroform, and sinapisms. *Symptomatic treatment* is often required. The above applications will usually afford relief, but if the tenesmus is very severe, warm emollient enemata or a suppository of opium may be tried. Of course *diet* requires the utmost care. Beef tea, soups, arrowroot, sago, raw white of egg, jellies, and such articles, should be given in small quantities between the periods of administration of the ipecacuanha. Stimulants are to be avoided generally, but in the typhoid condition they are certainly required. As the patient improves, so must the food be cautiously altered. *Hygienic measures* also demand every care, especially as regards *the immediate disinfection and destruction of the evacuations.*

The evidence in favor of the treatment thus far considered seems quite conclusive; but in a treatise of this kind it is necessary to mention the other chief methods advocated. These are: 1. By *astringents*, especially opium. These are useful if diarrhœa holds on after the stools have lost their dysenteric characters. 2. By *purgatives*, viz., castor oil, sulphate of magnesia, cream of tartar, &c. 3. By *venesection* and *calomel*. The last has been given in large quantities, or in doses of gr. i to gr. ij with opium, every three or four hours. This treatment had better be avoided, and the only removal of blood justifiable, in my opinion, is by the application of a few leeches in the left iliac fossa, should the pain be very intense, and the state of the patient favorable. 4. By a combination of *blue pill, opium*, and *ipecacuanha*. 5. By *antiseptics*. It is important to note that there are two forms of dysentery which require a modification of the treatment, viz., the *malarious* and the *scorbutic*. The former calls for full doses of *quinine*, alternating with the ipecacuanha; the latter for fresh fruits, and Maclean and others recommend Bael very highly in these cases.

In the management of *chronic dysentery*, the most essential matters are to regulate the diet, and attend to sanitary measures for improving the health. Mr. Harry Leach has found from his experience at the Dreadnought Hospital that rest for the bowels and body, with a bland nutritious diet, are the main things to be relied upon for a cure, and he considers that drugs are of little or no use. Certainly I think I have seen much benefit resulting from the use of Dover's powder in four or five grain doses three or four times daily, and still more from the administration of full doses of tincture of steel during the day, with a little Dover's powder night and morning. The stronger astringents, such as gallic acid, acetate of lead, sulphate of copper, or nitrate of silver are often employed, but they have never been of much permanent service in my experience. Small doses of bichloride of mercury have also been recommended. A dose of castor oil, with a little opium, may be taken from time to time. Opium enemata are sometimes beneficial, especially for relieving unpleasant sensations. Other measures recommended for this purpose are the use of a water compress over the anus, or gentle douching here; wearing a bandage over the abdomen, or a water-belt; friction over the abdomen with anodyne or irritant liniments; or the application of a blister over the left iliac fossa. Among the hygienic matters needing special attention are change of air, particularly speedy *removal from a malarial district*, or from a *tropical country to Europe;* the wearing of warm clothing; and the use of cold baths with friction afterwards, if they are well borne. Some employ baths containing dilute nitrohydrochloric acid. If there is any malarial, scorbutic, or other morbid condition of the system, the treatment must be modified accordingly. Any acute or subacute exacerbation of symptoms calls for complete rest and the immediate administration of ipecacuanha.

CHAPTER XXXVI.

INTESTINAL NEW FORMATIONS AND ULCERATIONS.

IN the present chapter it is proposed first to give a summary of the morbid conditions coming under the above headings, with some general remarks on their clinical features; and then to consider briefly such of the more important of them as have not already been noticed. The reason for treating new formations and ulcerations together is, that the former often originate the latter.

NEW FORMATIONS.—These include—1. Cancer. 2. Tubercle and other materials formed in the so-called tubercular disease. 3. Typhoid deposit. 4. Albuminoid infiltration. 5. Occasionally fibroid infiltration. 6. Rarely villous growths, polypi, adipose, cystic, erectile or glandular tumors, and calcareous deposits. The immediate *symptoms* due to these, if any, are either indicative of obstruction of the intestine, or of irritation and catarrh of the mucous membrane. Local pain and tenderness may or may not be complained of. Frequently there are constitutional symptoms, or some associated with other organs, which aid in determining the nature of the disease. In some cases *physical examination* may detect a growth.

ULCERATIONS.—The ulcers met with in the intestines may be thus arranged: I. *Non-specific.* 1. Those due to *direct injury* of the mucous surface by foreign bodies, calculi, hardened fæces, and chemical destructive agents, including probably acrid secretions. 2. Those originating in *inflammation.* Simple catarrh, especially if of long duration, may end in ulceration, either catarrhal or follicular. The separation of croupous or diphtheritic deposit may also cause it. Rarely it results from submucous suppuration, or gangrene. 3. *Perforating ulcer,* similar to the gastric variety, is now and then observed in the duodenum. The form associated with burns and scalds also needs to be mentioned. 4. Ulceration rarely results from some morbid condition *outside the bowel* making its way into the interior.

II. *Specific.* 1. Typhoid. 2. Tubercular. 3. Dysenteric. 4. Cancerous. 5. Syphilitic, probably. 6. Ulcers due to albuminoid disease.

SYMPTOMS.—The *local* symptoms suggestive of ulceration of the bowels are colicky pains; loçalized tenderness, especially if the disease is extensive or if the large intestine is involved; and diarrhœa, the stools often having very unhealthy characters, sometimes resembling peasoup or gruel, and being unusually fetid, or containing blood, mucus, or pus. Cases come under observation, however, in which *constipation* is the only conspicuous symptom. If the disease is limited to the small intestines, especially their upper part, the diarrhœa is of a simple kind, and it is usually only in such a case that constipation is observed. If the large bowel is much implicated, especially the rectum, the symptoms tend to be dysenteric. The diarrhœa is chiefly due to catarrh set up by the ulceration. The circumstances under which this occurs will generally aid much in indicating the event, as in typhoid fever, dysentery, or phthisis. When chronic, it is in some instances very difficult to make out positively that there is ulceration, and to distinguish this morbid condition from mere chronic catarrh, but it may be strongly suspected should there be diarrhœa, either constant or easily excited, or not amenable to treatment, especially if the stools are very unhealthy. The constitutional condition often affords aid in diagnosis. Ulceration itself tends to excite more or less pyrexia, which in chronic cases is frequently of a hectic type; and also leads to impaired nutrition, inducing emaciation, debility, and anæmia. It may cause peritonitis, perforation, or serious hemorrhage, and stricture may result from cicatrization.

TREATMENT.—It need scarcely be remarked that *attention to diet* is all-important in treating ulceration of the bowels. At the same time it must be so ordered as to promote the nutrition of the patient, and to be adapted for any morbid diathesis present. *Rest* of the body is highly beneficial, and of course the affected part should be kept as quiet as possible. This is best effected by administering *opium* in some form, if it is admissible; if not, other sedatives must be given, especially belladonna. Diarrhœa must be controlled by the various astringents along with opium. The chief remedies which are believed directly to promote the healing of ulcers are nitrate of silver, sulphate of copper, acetate of lead, oxide of zinc, and bismuth salts. Much benefit often follows the use of carbonate of bismuth with Dover's powder in the ulceration which occurs during phthisis, and also in other forms. It is not desirable to encourage long-continued constipation, but should this symptom be present much care is necessary in the employment of aperients, which must be of the mildest kind; simple enemata are very useful. Tonics are often indicated, especially preparations of iron. It is well to wear a warm bandage round the abdomen, properly applied. Local applications may be required from time to time. Some recommend an occasional blister over the right iliac fossa.

CANCER OF THE INTESTINES.

ANATOMICAL CHARACTERS.—Primary cancer of the intestines is very rare, and when they are involved, which is not common, it is generally by extension, especially from the peritoneum and subperitoneal tissue, though even then the muscular and mucous coats often escape. The large intestines, particularly the rectum and sigmoid flexure, are far more frequently attacked than the small, of which the duodenum is the part usually implicated. All varieties are met with, even melanosis, but scirrhus is the ordinary form. Epithelioma has rarely invaded the rectum by extension from the uterus and vagina. Sometimes encephaloid arises on a basis of scirrhus, when the latter reaches the interior of the bowel.

There are the usual variations in the *characters*, *arrangement*, and *extent* of the cancer. It may be limited to one part, occasionally forming a rounded or lobulated tumor, or widely spread, or in scattered nodules, which are often secondary to some more localized and extensive deposit. In the progress of the disease the coats are matted together, and ultimately, if the mucous membrane is implicated, ulceration or sloughing ensues, the ulcer being either smooth and excavated, with thickened, indurated, and tolerably regular edges; or presenting an irregular aspect, with fungous growths along the floor and margins, often very vascular, and liable to bleed freely. Perforation may take place, not uncommonly into hollow organs. Frequently the affected part of the intestine is much constricted, while the part above is dilated and its muscular coat hypertrophied, the portion beyond being contracted.

SYMPTOMS.—The following are the clinical phenomena to be looked for as indicative of cancer of the bowels, viz.: localized pain in the abdomen, either constant or at intervals, dull and aching or lancinating, with tenderness; habitual constipation, with abnormal shape and size of the stools, ultimately culminating in complete obstruction; a tumor deep in the abdomen, hard, irregular, and tender, at first movable, afterwards fixed; with marked and rapid wasting and loss of strength, as well as signs of the cancerous cachexia, or of cancer in other parts. In some instances, however, there is diarrhœa, especially after ulceration, when the stools become extremely offensive, and occasionally symptoms of obstruction disappear, owing to a mass of cancer sloughing or ulcerating away. When the rectum is affected the pain is referred to the sacrum, shooting towards the thighs and back, being often extremely severe. Symptoms of a dysenteric character are then generally complained of. Examination per rectum may reveal the disease. Cancer is liable to give rise to much hemorrhage, or it may lead to perforation, or to extensive destruction of neighboring organs. Death is usually gradual, but may be hastened by complete obstruction, perforation, peritonitis, or hemorrhage.

TREATMENT.—This can only be of a symptomatic kind. In some instances life may be prolonged by making an opening into the bowel above the seat of the disease, if this is low down.

TUBERCLE OF THE INTESTINES.—TUBERCULAR ULCERATION.—SCROFULOUS DISEASE OF THE INTESTINES.

ETIOLOGY AND PATHOLOGY.—There are the same differences of opinion as to the pathology of the so-called *tubercular disease* and *ulceration* of the intestines, as in the case of other affections of this class. Some explain all the phenomena by the *deposit of tubercle*, and its subsequent destruction with that of the involved tissues. Others consider that *true tubercle* is but rarely formed, and that the appearances are usually due to the proliferation of cells in the glands, which become caseous and break down, ultimately destroying the membrane above and forming ulcers, which spread by further cell-formation and disintegration in the surrounding mucous and submucous tissues. Niemeyer granted that *secondary tuberculosis* is met with sometimes in the immediate vicinity of ulcers, especially in the peritoneum corresponding to these, but believed that as a *primary* condition it is extremely rare.

It certainly is most difficult to determine what is tubercle and what is not, in the intestines. Niemeyer stated it would be best recognized by being deposited in separate nodules or groups, where there are no Peyer's patches.

As a localized affection, implicating at the same time the mesenteric glands, this complaint is by far most frequent in scrofulous children; in adults it almost always occurs secondarily to pulmonary phthisis.

ANATOMICAL CHARACTERS.—In the great majority of cases it is the solitary and Peyer's glands which are chiefly implicated, and hence the morbid appearances are observed in the *lower portion of the small intestines*, or are most advanced there, while they gradually cease towards the jejunum. Occasionally they extend into this portion, or, very rarely, even to the duodenum. Not uncommonly the cæcum, appendix, and colon are involved, to which sometimes the disease is chiefly or entirely limited. The area affected varies greatly, and generally the morbid changes are seen in different stages in different parts. At first little, firm, gray, projecting nodules are seen, which become yellow, soften and break down, producing small circular ulcers. Apart from their situation, it appears impossible to distinguish between the granulations of tubercle and those due to enlarged glands. The ulcers soon become larger, however, either by infiltration and destruction around, invading tissues far beyond the glands, or by coalescence, and come to present special characters, in which condition they are generally seen. These characters are more or less irregular in shape; a transverse direction as regards the bowel, the ulcer spreading mainly in the course of the vessels, and sometimes completely surrounding the gut with a band of ulceration ½ to 1 inch or more wide; thickening, irregularity, and induration of the margins and floor, the latter presenting nodules; and but little proneness to heal. Imperfect or partial cicatrization is, however, often observed, with the formation of a dense tissue, sometimes pigmented, the edges being drawn together, and thus contraction and irregularity of the gut is produced, or complete stricture.

During the process of ulceration local peritonitis is set up, causing thickening and adhesions, and thus all the coats are frequently destroyed without the occurrence of any symptoms of perforation, or sometimes a communication is formed between two portions of the intestines. Secondary tubercles are often observed in the affected portion of the peritoneum, which may spread along the lymphatics to the mesentery. The floor of ulcers not uncommonly presents evidences of hemorrhage. Niemeyer stated that true tubercular ulcers are not so extensive as those having the other mode of origin.

SYMPTOMS.—Tubercular disease of the bowels is indicated in the child by the occurrence of persistent or frequent symptoms of intestinal irritation and catarrh, associated with the general symptoms of tuberculosis, much wasting, and retarded development. In the adult ulceration may be suspected if in the course of phthisis the symptoms already described occur, especially if diarrhœa sets in, which will not yield to proper treatment, and if there is localized tenderness; but it is in these cases that constipation is most frequently observed, this being sometimes due to peritonitis, and on the other hand diarrhœa is often dependent upon other causes.

TREATMENT has been sufficiently indicated when speaking of ulcerations in general.

ALBUMINOID INFILTRATION.

The œsophagus, stomach, and intestines may become the seat of albuminoid disease. In the intestines it begins in the small vessels of the villi, and then spreads to the other vessels; in time it involves the glands, the entire villi, and ultimately the whole of the mucous coat or even the submucous and muscular coats. Extensive atrophy of the villi may result. The morbid material is liable to undergo disintegration, forming a yellow substance, and finally small ulcers are sometimes formed, corresponding to the glands. It is very difficult in the early stages to recognize this morbid condition. The surface appears pale, anæmic, and glistening or shining, but the iodine test is necessary to bring out evidence of the deposit, which it shows to be in the villi and small vessels. In more advanced cases the appearances are more characteristic, and enlarged glands or ulcers are seen, especially corresponding to Peyer's or the solitary glands. Peyer's patches sometimes present a reticulated aspect.

SYMPTOMS.—Should there be evidences of albuminoid disease of other organs, the same condition of the alimentary canal may be fairly diagnosed, if obstinate diarrhœa should set in, with liquid stools, which are often greenish or otherwise unhealthy. Hemorrhage is liable to occur later on, and it may be quite independent of ulceration. Implication of the stomach is indicated by persistent vomiting, with signs of imperfect digestion. When the alimentary canal is affected, nutrition is necessarily gravely interfered with.

TREATMENT.—In addition to that required for albuminoid disease in general, the treatment recommended for gastric or intestinal catarrh and ulceration must be followed.

CHAPTER XXXVII.

INTESTINAL OBSTRUCTION.

ETIOLOGY AND PATHOLOGY.—The numerous causes of obstruction of the bowels may be ranged under certain heads, viz., 1. *Accumulations in their interior*, of hard fæces; indigestible matters, either taken in the food, such as oat-cakes, rice, seeds or stones of fruits, or swallowed purposely, especially by hysterical girls and children, *e. g.*, string, hair, dirt, sand, &c.; certain medicines, which are apt to form concretions if taken for some time in quantity, viz., magnesia and sesquioxide of iron; masses of worms; large or numerous agglomerated gallstones; concretions of phosphate or carbonate of lime. Gallstones are usually stopped high up in the small intestines. 2. *Stricture resulting from morbid changes in the coats of the bowels.* *a.* Congenital constriction, chiefly about the anus, rarely in the duodenum. *b.* Cicatrization of an ulcer, especially if it has passed round the gut, or has been very extensive. *c.* Fibroid infiltration of the walls. *d.* Cancer. This class of causes is by far most common in connection with the large intestines. 3. *Compression, constriction, or traction due to morbid conditions external to the intestines.* Dr. Hilton Fagge has drawn particular attention to some of these causes, which include pressure by displaced or enlarged organs and tumors of various kinds, particularly in connection with the uterus and ovaries; by growths or accumulations in the intestine itself; or by certain adhesions, agglutinations, or deposits in the peritoneum, sometimes after simple peritonitis, but more frequently associated with tubercle or cancer. These latter may lead to distinct constriction, or give rise to a sudden bend or twist in the intestines; but usually they merely impede the peristaltic action, either by compressing the bowel somewhat for a considerable extent, binding it down, exerting traction upon it, or matting together several coils. Hence materials collect above, which press upon the portion below, inducing complete obstruction; this is frequently aided by a certain degree of spasm. These causes mainly affect the small intestines. 4. *Strangulation or incarceration, either external or internal.* Under this group come the different forms of hernia, not forgetting the rarer varieties. Internal strangulation rarely results from the passage of a portion of intestine into some normal opening, especially the foramen of Winslow; or into a perforation in one of the folds of the peritoneum, *e. g.*, the omentum or mesentery. Generally, however, it is due to peritoneal bands of adhesion, passing between different parts; or to the vermiform appendix or diverticula connected with the ileum, which become adherent at their ends. Very exceptionally one portion of the bowel is strangulated by another, by the mesentery, or by its entrance into a rupture in the intestine or some other hollow viscus. 5. *Altered relation of portions of the bowel or of the intestinal coats.* The important form of obstruction coming under this head is *intussusception, invagination,* or *volvulus,* in which one portion of the intestine is prolapsed into that next below. Another variety is named *torsion* or *rotation,* in which the bowel, with its attached mesentery, is twisted, though Dr. Bristowe considers that this twisting is in many cases not the *cause* of obstruction, but the *effect* of enteritis, which has been the primary mischief. *Prolapsus ani* also ranges under this group, though it scarcely ever leads to complete obstruction. As very rare conditions have been mentioned *sacculation* of a part of the bowel, and *hernia of the mucous membrane* through the other coats. 6. *Spasm or paralysis of the muscular coat.* Either of these conditions may aid in inducing obstruction, or now and then possibly is the sole cause.

With regard to the determining cause of intussusception, a few remarks are necessary. It depends upon the peristaltic action of the intestines, and is supposed to be chiefly the consequence of undue-dilatation of a portion of bowel towards which the wave of contraction is advancing, from accumulation of gas or any other cause, and to its being fixed, so that the part above is driven into it by its own contraction. In many cases some violent exertion, in which the muscles of the abdominal walls partake, determines the occurrence of intussusception. It has also been stated to be originated by worms or polypi, and to be frequent in connection with chronic diarrhœa. Once it has started, the invagination increases by the continuance of the peristaltic action, by which more bowel is driven in from above, at the same time the outer tube of intestine being inverted. Some of the other forms of sudden obstruction may be also induced by severe effort. Sex and age require notice as important predisposing causes of certain varieties of obstruction. That resulting from impaction of gallstones is by far most frequent late in life, and in females. Strictures are more common in males, and after middle life. Internal strangulation does not often occur under 30, except that due to adhesions of the appendix vermiformis or of diverticula, which is observed in young persons most frequently, and chiefly in males. Ileo-cæcal intussusception is remarkable for its frequency in children, but in the ileum or jejunum it is almost limited to adults; on the whole it is twice more common among males.

ANATOMICAL CHARACTERS.—The appearances met with after death in cases of intestinal obstruction necessarily vary much according to the condition upon which it depends; only *intussusception* calls for special description. By far the most common form of invagination is that in which the ileo-cæcal orifice descends into the cæcum, and then passes on into the colon, bringing down more and more of the ileum. It is not very uncommon in the ileum or colon, but is rarely observed in the jejunum or rectum. Very exceptionally the end of the ileum passes through the ileo-cæcal opening, the lips of the latter not being displaced. The portion of intestine which is the seat of invagination presents three layers, arranged concentrically; the most internal is the part which has descended, the outer one is the sheath or intussuscipiens, and the middle layer unites these, being derived from the continued involution of the sheath, and its surfaces are necessarily reversed, so that its serous coat is in contact with that of the internal layer, and its mucous coat with that of the external, while the mesentery belonging to the middle and internal layers is drawn in, and lies between them. This exercises unilateral traction, whereby the intussuscepted portion is curved, with the concavity towards the mesentery, and its lower opening looks towards some part of the wall of the outer tube, being elongated and fissure-like. The affected portions of bowel are more or less convoluted or twisted, especially the middle layer.

The extent of the invagination varies considerably, ranging from an inch or two to three or four feet, or even much more, especially in the ileo-cæcal variety; not uncommonly short intussusceptions are found in the small intestine, in persons dying from various diseases, which are easily reduced, and have given rise to no symptoms during life; some believe that these are originated during the act of dying, or even post mortem. In the great majority of cases, however long the intussuscepted portion may be, its lower end continues the same as at the commencement. Ultimately it may reach the anus, or even protrude through this.

Certain important events are liable to happen in connection with the invaginated portion of intestine. (1.) Of course the inner layers are more or less compressed by the outer tube, especially at the entrance or *neck* of the invagination ; the canal is therefore narrowed, but not usually completely closed at first. (2.) The return of blood is interfered with, and hence results mechanical congestion, often intense, with œdema of the tissues, or even escape of blood between the mucous surfaces, or into the canal, where it is mixed with serum ; consequently thickening and swelling occur, which increase the obstruction. (3.) Soon peritonitis is set up over the contiguous surfaces of the serous coat, with exudation of lymph, and this may spread and become general, or the formation of adhesions may limit the further descent of intestine. (4.) Violent enteritis is excited, and ultimately, owing to this and the congestion, gangrene not uncommonly results. (5.) In some cases the mortified portion becomes detached, either completely or in part, and either in one mass or in fragments, and is expelled per anum. The dangers of this separation may be prevented by adhesions having formed between the top of the outer tube and the intestine above ; but if these are not sufficiently firm, the structures give way, with the escape of the intestinal contents into the peritoneum. If the bowel is expelled, and adhesions are complete, recovery may follow, but there is still a further danger of a stricture forming at the point of union ; or sometimes only a part of the invaginated bowel comes away, while the upper portion remains and becomes adherent to the surrounding tube, and thus there is more or less permanent obstruction. The rapidity with which the changes above described are set up depends on the severity of the compression, and therefore upon the part of the bowel involved. They are much more rapid in connection with the small intestines than the large, but especially when the ileum passes *through the ileo-cæcal orifice*, without disturbing it.

The portion of intestine above that which is intussuscepted acts with undue vigor, and thus aggravates the mischief, while at the same time it drives on some of the contents of the bowel. For a time also the affected part itself contracts. By the pressure of its lower end against the wall of the outer sheath, ulceration of the mucous surface is often excited. Very rarely double intussusception has been observed.

Any sudden constriction will necessarily lead to congestion of the bowel and its consequences, inflammation, involving also the peritoneum, and ultimately gangrene and perforation if it is not relieved. In prolonged cases the part of intestine above an obstruction becomes much dilated, elongated, and hypertrophied, (though these appearances are not always most marked directly above the impediment), and fæces, &c., accumulate, giving rise to catarrh or ulceration, while the distal portion is contracted, empty, and atrophied.

Symptoms and Diagnosis.—The direct clinical phenomena which in the first instance indicate complete obstruction of the bowel, from whatever cause, may be stated generally as *absolute constipation*, usually accompanied with *colicky pains*, often severe, *increased peristaltic movements of the intestines, borborygmi, abundant formation of gas* leading to *tympanitis, nausea*, and *vomiting*, the latter ultimately becoming *stercoraceous* or *fecal*. Not uncommonly *physical examination* of the abdomen and rectum reveals some abnormal condition. In many cases symptoms indicative of severe enteritis, peritonitis, or perforation occur subsequently. There are some circumstances which have an important influence on the clinical history of obstruction, especially the *pathological conditions* to which it is due, and its *seat*. Practically, cases may be divided into two classes, viz., 1st, those in which the obstruction is gradual; and 2dly, those in which it is sudden. In the former class of cases there has been constipation for a variable period, sometimes alternating with diarrhœa, often with alteration in the shape and size of the solid stools, colicky pains, nausea and vomiting from time to time, and other digestive disturbances, with perhaps occasional signs of complete temporary closure of the bowels, and there may be physical signs of some mechanical obstruction. They may terminate slowly by asthenia, or culminate in a sudden attack of absolute stoppage of the bowels. The pain associated with obstruction is at first of a griping character, in some forms being sudden and severe, frequently starting from about the umbilicus, but it may radiate from some other locality which corresponds to the seat of the disease; after a time peritonitic pain not uncommonly supervenes. Absolute constipation is not an invariable symptom, for when the small intestine is implicated, its liquid contents can pass along unless there is complete closure; and the same may occur when intussusception affects the large intestine; further, fæces contained in the bowels below an obstruction are often expelled. Occasionally blood and mucus are discharged, especially in invagination of the large bowel. Vomiting is more easily excited and more severe the nearer the stoppage is to the stomach. At first it is sympathetic in most cases, but soon the rejected matters have a distinctly fecal odor, and present an appearance like pea-soup, consisting of materials which have either flowed back into the stomach from the bowels, or been forced by anti-peristaltic action or by external pressure. In some instances there is more or less suppression of urine, especially if the obstruction is high up, which is most probably a sympathetic derangement.

The further elucidation of the clinical history of these cases will be best aided by considering the points on which a *diagnosis* is founded. This has to determine, 1st, the existence of an obstruction and its cause; and, 2dly, its situation.

In conducting the examination the following course may be adopted: 1. The *age* and *sex* should be noted, the influence of these as predisposing causes of different varieties of obstruction being borne in mind. 2. Certain questions in the past history of the patient should be specially inquired into, viz., whether articles have been taken, either in the diet or in any other way, which might form concretions in the bowels; the habitual state of the bowels; and if there is any history of previous intestinal ulceration, peritonitis, passage of gallstones, or of uterine displacement, or other condition which might give rise to pressure. 3. Any peculiar constitutional condition must be observed, and this may afford some aid, as, for instance, by indicating the cancerous cachexia, phthisis, which is liable to be attended with ulceration and its consequences or tubercular peritonitis, chronic dysentery, or hysteria, in connection with which accumulations of fæces are common, and possibly paralysis may occur. 4. As regards the history of the attack itself, it should be ascertained whether it has been gradual or sudden in its onset, and how long it has lasted;

if the former, what the state of the bowels has been, if any peculiar alteration in the stools has been observed, or if there have been previous attacks of complete obstruction which have yielded to treatment; if the latter, whether the attack can be traced to anything having been swallowed, or to any sudden effort or other cause, and if it has commenced with any severe localized pain.

The precise local and general symptoms must of course be carefully noted, whether as indicating simple obstruction, partial or complete, or in addition enteritis or peritonitis; and also the rapidity with which stercoraceous vomiting sets in. 6. Careful *physical examination* is essential. (*a.*) *All forms of hernia* must be thoroughly sought after. (*b.*) Any contraction or distension of the abdomen, either general or local, must be noted, a view being also taken from behind; in the early stages this may help much in fixing upon the seat of any obstruction. (*c.*) The latter may also be partly determined in some cases by observing the situation of any violent peristaltic movements in the intestines. (*d.*) Among the more important conditions discoverable by satisfactory investigation of the abdomen (which may also point to the situation of a stricture), are accumulations, including impacted gallstones, the onward progress of which can occasionally be traced; tumors of various kinds, either external to or associated with the intestines; and intussusception. It must be remarked, however, that even when these exist, it is frequently, for many reasons, difficult or impossible to detect them. (*e.*) Examination per rectum by the finger, hand, or bougie is often most serviceable. The amount of fluid or air which can be injected per anum has been stated, especially by the late Dr. Brinton, to be of much aid in fixing upon the seat of any stoppage, but this must be by no means implicitly relied upon. (*f.*) Of course, should anything be vomited or passed by stool, the materials thus discharged should be properly examined. 7. In any doubtful case it is necessary to watch its progress as regards its course, rapidity, and termination, and this may soon afford considerable assistance in diagnosis.

Having given this outline of the method of investigation to be pursued, it will be well to add a brief summary of the chief clinical features of each class of cases of obstruction.

1. *Accumulations* are generally gradual in their progress, but

in some instances, especially when due to gallstones, the symptoms are very sudden. The physical signs and consequences of most of these collections have been already considered in a former chapter, and here it need only be remarked that impacted gallstones are particularly liable to set up violent enteritis, and the course of these cases is usually very rapid. 2. *Strictures* and *compressions* of the bowel may be considered together; they are usually chronic in their progress, complete obstruction being preceded by gradually increasing constipation, sometimes interrupted by attacks of diarrhœa; diminution in size and change in shape of the stools, should a stricture be near the end of the intestines; liability to colicky pains, sickness, and other digestive disturbances; and interference with nutrition. From time to time also there may be signs of temporary complete obstruction. There may be a history of some cause, or physical signs may be yielded of a morbid condition likely to give rise to stricture or compression. Commonly these cases linger a long while, even after there is absolute closure of the bowels. Now and then, however, symptoms of obstruction come on suddenly without any particular previous symptoms, followed by enteritis or peritonitis. Possibly some accumulation above the stricture may then be the immediate cause of the symptoms. 3. *Strangulations* give rise to rapid and absolute obstruction, followed speedily by signs of severe enteritis or even gangrene of the intestines, perforation, and peritonitis. If not relieved their issue is quickly fatal. Many of these cases can only be determined by exclusion, and frequently can merely be guessed at. A previous history of peritonitis may help, and the immediate attack is often due to some violent exertion. 4. *Intussusception* is also sudden in its onset as a rule, beginning with griping pain, more or less violent, usually referred to the umbilical region. Subsequently there are colicky pains from time to time, with the ordinary signs of obstruction, followed by those of enteritis or peritonitis. The other important diagnostic evidences of invagination are the passage of blood per anum, in some cases mixed with mucus or decomposed tissues; the detection of a "sausage-shaped" tumor in the abdomen, corresponding to some part in the intestine, presenting peristaltic movements, and altering as the case progresses in its direction, extent, and shape; and the end of the intussuscepted portion being felt or seen by examination of the rectum, or more or less of it being discharged in a gangrenous condition. In the latter case sudden perforation and its consequences may happen. There are, as a rule, some important distinctions between invagination of the small and large intestines, viz., that in the former the symptoms are greatly more severe and acute in their progress; hemorrhage is much more abundant, blood being sometimes vomited also: while in the case of the large bowel, there is generally much tenesmus, with dysenteric stools. Physical examination may afford some aid. A large proportion of these cases end fatally, those in which the large intestine is involved sometimes lasting many weeks or months. The several events which may happen in their course are indicated in the account of the morbid anatomy. 5. It is scarcely practicable to indicate the characters of obstruction from spasm or paralysis of the muscular coat. The occurrence of chronic constipation in a hysterical female, ending in complete obstruction, might suggest paralysis, though probably the previous accumulation of fæces actually originates the obstruction. It generally yields to treatment.

PROGNOSIS.—Without entering into details, it will be evident that all obstructions of the bowels are exceedingly dangerous. The most speedily fatal are strangulations and intussusceptions. The chronic varieties are liable at any moment to end in complete closure. Accumulations may often be got rid of, and thus recovery be brought about.

TREATMENT.—This must be considered separately, according as the obstruction is chronic and gradual in its progress, or sudden and acute.

In *chronic* cases, the main principles are to regulate the diet strictly, allowing only liquid or pultaceous, highly digestible and nutritious articles, in moderate quantities; to endeavor to keep the bowels acting comfortably, for which mild enemata are best, at the same time avoiding the use of strong purgatives; to remove, if possible, anything causing compression, as well as accumulations; to support the strength of the patient, and improve the general condition; to treat troublesome symptoms referable to the digestive organs; and, in appropriate cases, to have recourse to certain operations.

Should there be a stricture in the rectum, it may often be dilated successfully by the cautious use of the bougie. In certain instances also, it is desirable to make an *artificial anus* above an obstruction, as described in surgical works, which may prolong life considerably.

In cases of *acute obstruction*, from whatever cause, a matter of prime importance is not on any account to excite the intestines by giving powerful purgatives. It is allowable to use enemata carefully, so as to clear out the bowel below the seat of obstruction. Of course little or no food should be taken by the mouth, and soon the smallest quantity is rejected immediately; therefore all the necessary support, including stimulants when required, must be administered per rectum, and frequently considerable quantities of these are needed. The patient may be permitted to suck ice. The most important internal remedy is *opium*, in full doses, which is best introduced by subcutaneous injection. Belladonna is also highly recommended, or this drug combined with opium. For intussusception tobacco has been employed, usually in the form of an enema of its infusion, but it is a dangerous remedy. External applications of dry heat, poultices or fomentations, turpentine stupes, sinapisms, &c., are very serviceable. Vomiting and other symptoms call for the usual remedies for their relief. In the case of intussusception, the gradual injection of a large amount of liquid or air per anum has been frequently employed, and apparently with benefit.

The question of operating presents itself in many of these cases. Of course if there is any evident or suspected hernia, surgical interference is necessary. Another operation, which might be indicated, is to open the abdomen, with the view either of removing some internal strangulation, or of reducing an invagination. If there is good reason to believe that the former exists, it is decidedly permissible to risk opening the abdomen, especially if the case seems otherwise hopeless. As regards intussusception, it is considered by most authorities only allowable to attempt its reduction when the large intestine is involved. Under any circumstances the results are not very satisfactory.

CHAPTER XXXVIII.

INTESTINAL WORMS—HELMINTHIASIS.

In the present article it is intended to give a brief account of the main facts relating to those animal parasites which infest the alimentary canal of human beings; but it will be convenient in noticing their life-history, to allude to another phase of their existence, as they are found in other organs of the body. For a complete account of this subject, the reader is referred to Dr. Cobbold's valuable work.

The ordinary intestinal worms include: 1. *Cestodes* or *tapeworms*. *a.* Tænia mediocanellata. *b.* Tænia solium. *c.* Bothriocephalus latus. 2. *Nematodes*. *a.* Ascaris lumbricoides (round-worm). *b.* Ascaris or oxyuris vermicularis (threadworm or seat-worm). *c.* Tricocephalus dispar (hair-headed or whipworm). Among rare varieties are mentioned tænia nana or egyptica, elliptica, and flavo-punctata; bothriocephalus cordatus; ascaris mystax; dochmius duodenalis; distoma crassum and heterophyes.

Etiology and Development.—It seems tolerably certain that no intestinal worm develops there directly from an ovum deposited by a previous tenant, but that this must be first discharged and undergo metamorphosis, being afterwards conveyed by some means through the mouth into the alimentary canal, in a certain stage of development, and when it reaches its peculiar habitat, it grows into the adult animal. As regards the development of the nematodes, an embryo forms in each ovum after its discharge in the stools, or in the case of the threadworms, even while in the intestines; no further change occurs while the ovum is outside, though it may retain its vitality for a long period. In this condition it is supposed to enter the alimentary canal in various ways, such as by water, vegetables, fruit, or impure starchy substances. The ova of threadworms may also probably be carried to the mouth by the fingers of a person already infected, after scratching the anus. From some experiments, however, it would appear that the embryos of round-worms will not undergo further change when introduced into the stomach in the free state, and it has been suggested that they are taken up by some other animal, such as a small worm or insect or its larva, which is swallowed, attached to vegetables, &c.

The development of *tapeworms* is better known. Segments of these, containing abundant ripe ova, separate and are discharged per anum, or even break up within the bowel; the ova escape and are scattered about in various ways; they are then swallowed by different animals, especially by pigs, oxen, and sheep, mixed with their food. In the alimentary canal the shell ruptures, and then the embryo (*pro-scolex*) escapes, attaches itself to the mucous surface, and works its way into the tissues, until it reaches a suitable spot, where it settles down and undergoes further changes, presenting a head and neck, with appendages, like those of a tapeworm (*scolex*), from which a vesicular appendage or bladder hangs down. In this stage the worm is named a *cysticercus*, or bladder-worm, such as is seen in the muscles, liver, brain, and other organs and tissues of different animals, sometimes in human beings. Each tapeworm has a special form of cysticercus; that of the tænia solium is named the *cysticercus cellulosus;* that of the tænia mediocanellata, the *cysticercus mediocanellata.* This cysticercus may remain for some years, or finally perish; if, however, it in any way reaches the alimentary canal of the particular class of animal which it infests in the adult condition, it becomes attached by the head, the vesicle falls off, and then a succession of segments form, constituting the ordinary tapeworm. The usual way in which these larvæ reach the stomach is through eating the raw or imperfectly-cooked flesh of the animals in which they occur; thus the tænia solium comes from pig's flesh (measly pork, &c.), tænia mediocanellata from beef; bothriocephalus is believed to be conveyed by fish or mollusks.

Different varieties of tapeworm are found in different parts of the world. In this country the tænia solium and mediocanellata are the forms met with, the latter quite as frequently as, if not more frequently than, the former. Bothriocephalus is prevalent in Eastern Europe as far as the Vistula, and in Switzerland, especially along seacoasts and rivers. Tapeworm is by far most frequent in those countries where much pig's flesh is consumed, and individuals who do not eat this, such as Jews, are particularly exempt from the complaint. It is frequently observed among those who in their occupation are in the habit of putting knives, used for cutting raw meat, into their mouths, such as butchers, cooks, &c.; also among those who indulge in raw or very underdone meat, sausages, and such articles, as then the parasites are not destroyed. It must be remembered that in this country beef is often the meat by which tapeworm is communicated. The bothriocephalus is supposed to be taken in drinking-water. Women suffer more frequently than men, and usually the persons affected are between 16 and 40 years of age.

Round and threadworms are principally found in children, especially if they are in bad health, or improperly fed and dirty. Roundworms are very prevalent in some parts of the world, viz., the Southern States of America, Greenland, Iceland, Brazil, and some parts of Holland, Germany, and France, especially in low and damp districts. They are common enough in this country. It is presumed that an unhealthy condition of the enteric mucous membrane, leading to the formation of much viscid mucus, favors the development of worms.

DESCRIPTION.—Only the main characters of the ordinary worms can be noticed here, so as to enable them to be recognized.

I. TAPEWORMS.—In the adult form (strobila) they are elongated, narrow, flattened, or tape-like in form, consisting of a head, neck, and a series of thin, flat, quadrilateral segments or links (proglottides), varying in number according to the length of the worm, united by a softer and more transparent tissue. The links grow from behind the neck by budding, and then pass on, making room for those more recently formed, so that the oldest are the most distant from the head. At first they are very small, but enlarge considerably as they become more mature, at the same time altering in form somewhat, and presenting a more complicated structure. Tapeworms are parenchymatous in structure, consisting of a soft, whitish, or yellowish-white contractile tissue, having no mouth or alimentary canal, but presenting a water-vascular system communicating between the segments, and well-developed sexual organs. These are not evident in the most recent links; the female apparatus appears first as a median tube with lateral branches, subsequently becoming more divided, and developing ova, which almost completely fill the terminal links, rendering them opaque, and in these embryos may be visible. The male organs consist of tortuous seminiferous tubes and a penis. Each segment is hermaphrodite, and the sexual orifice is either single or double, opening either laterally or on one surface. All the varieties of tapeworm inhabit the small intestine ordinarily; rarely one may enter the large bowel or the stomach. As a rule, only a single worm is present; occasionally two or more.

1. *Tænia Solium.*	2. *Tænia mediocanellata.*	3. *Bothriocephalus Latus.*
Length varies from a yard to 100 or 150 feet or more, but average is stated by different authorities at from 5 or 7 to 20 or 30 feet. *Head* very small, somewhat globular or bulbous, with a slightly prominent conical snout or rostellum in front, surrounded by a double row of curved, silicious hooks, from 12 to 15 in each row, and further back 4 suckers, symmetrically arranged. *Neck* extremely slender, from ½ to nearly an inch long, transversely marked. *Segments*, in their earliest stage very small and much broader than long; gradually become more flattened and altered in the relation of their diameters, so as to be first square and afterwards oblong, being *much longer than broad*, with the ends narrowed, especially the anterior. Mature links measure about ½ an inch long and ¼ inch broad. *Male and female organs* open by one orifice, which is situated *laterally*, in a little projection, now on one side, now on the other, but not regularly alternating.	Has a general resemblance to tænia solium, with the following differences. *Length* usually greater. *Head* larger, has neither snout nor hooks, being flattened in front, but its 4 suckers are very prominent and powerful. Leuckart describes a fifth smaller one between them. *Links* more numerous, broader, thicker, and firmer. *Sexual organs* more developed and divided, and orifice nearer the posterior border.	*Length* very considerable. *Head* obtuse or club-shaped, having no hooks or prominences, but merely two longitudinal slits or grooved suckers, one on each side. *Neck* very short. *Segments* exceedingly numerous; not distinctly visible for a little distance from the head; at first nearly equal in diameters, but soon *much broader than long;* have a slightly brownish color. *Sexual openings* in the *middle of one surface* of each segment, near its posterior border, and not lateral; they are distinct, that of the male apparatus being anterior. Ova of a brown color.

II. Nematodes.—The main characters of these are indicated in the following table:

1. *Ascaris Lumbricoides.*	2. *Ascaris Vermicularis.*	3. *Tricocephalus Dispar.*
Form elongated and cylindrical, but tapering towards the ends, especially the anterior. *Length* from 6 to 12 or 16 inches, and diameter 2 to 3 lines. Appears reddish, grayish-red, or yellowish-white, semi-transparent, firm, and elastic. *Head* has three small prominences, with the mouth between, lined with numerous teeth. A circular depression separates it from the body. The body presents fine transverse markings. Sexes are distinct. *Male* shorter, and curved posteriorly, where the sexual organs are placed. *Female* straighter, and thicker at the hinder extremity; has the sexual opening about the end of the anterior third. *Habitat*, small intestines, but often migrates into the large and out through the anus, or rarely to the stomach, œsophagus, mouth, nares, frontal sinuses, windpipe, bile and pancreatic ducts or gall-bladder, peritoneum, vagina, urinary organs, and various other parts. *Number*, usually several; may be hundreds; sometimes only one.	Very small and delicate, fusiform, males measuring from 1 to 2 lines long, females about 5 lines. Whitish and semi-transparent; surface presents fine transverse striæ. *Head* has a terminal mouth, with 3 scarcely evident lips, and a wing-like expansion on the dorsal and ventral aspects. *Male* is rolled up posteriorly, where the sexual organs are placed. *Female* is straight, or but slightly bent, and has the vulva about the junction of the anterior and middle thirds. *Habitat*, the rectum and lower part of colon. Often migrate around the anus into the vagina, urethra, or under the prepuce. Have been seen in the small intestines and stomach. *Number* usually very great; hundreds or thousands.	Thread-like in form, being from 1 to 1½ or 2 inches long. Posterior end thicker than anterior, which is hairlike, and ends in a simple terminal mouth. *Male* is the smaller, and is spirally coiled posteriorly. *Female* is larger and thicker, only slightly curved; the uterus contains an immense number of ova. *Habitat*, usually the cæcum, rarely the colon, very rarely the ileum. The head is generally imbedded in the mucous membrane, while the body moves freely. *Number*, usually not great, but may be hundreds.

Symptoms and Diagnosis.—Worms frequently exist in the alimentary canal without exciting any evident symptoms. When present they are usually indicative of local irritation, reflex disturbance, and more or less constitutional disorder. Occasionally worms lead to congestion, inflammation, superficial erosions of the mucous surface, or even slight ulceration, and in exceptional cases they may even cause obstruction of the bowels, or by migrating into the stomach, bile-ducts, liver, larynx, peritoneum, and other parts, originate dangerous symptoms referable to these.

It may be stated as a general rule that the symptoms are more marked in delicate and weakly persons, or in those whose nervous system is highly susceptible, and that they are in proportion to the number and size of the worms.

The *local symptoms* attending the tape and round worms are uneasiness, curious sensations, or actual griping pain in the abdomen, especially about the umbilicus, sometimes amounting to attacks of severe colic, attended with vomiting and retching, faintness, &c.; capricious and variable appetite, often with craving for special and indigestible articles of food; furred tongue and foul breath; nausea or vomiting; irregularity of the bowels, constipation and slight diarrhœa alternating from time to time, the stools sometimes containing mucus; flatulence with distended abdomen. The main *reflex phenomena* described include itching at the various mucous orifices, causing scratching of the anus, picking of the nose, &c.; salivation; grinding of the teeth during sleep, which is uneasy and disturbed; dull, frontal headache, with giddiness; noises in the ears; squinting, dilated pupils, œdema of eyelids, flashes and specks before the eyes; twitchings of the limbs or facial muscles, or violent convulsions ending fatally; chorea, hysterical, epileptic, or even maniacal attacks; deranged menstruation; palpitation; a feeling of constriction in the throat. Among the *general symptoms* observed are more or less wasting, pallor, sense of debility and languor, pains in the limbs, fretfulness and depression of spirits.

In a diagnostic point of view these symptoms are by no means characteristic of worms, and it is often a question how far they are due to these: still when they are present, worms should always be thought of. The diagnosis may be verified by the passage per anum of fragments of a tapeworm or of entire roundworms, and, if necessary, remedies may be given with the view of aiding their expulsion. Microscopical examination of the stools for ova is recommended in suspected cases. Portions of tapeworm sometimes escape spontaneously as the patient is walking along.

Threadworms are very common in weakly and dirty children, and as they are often extremely numerous, they give rise to much local irritation, causing severe itching and tickling about the anus, which leads to constant scratching; this is especially intense towards night, and may gravely interfere with sleep. Occasionally these worms excite considerable dysenteric symptoms, and not uncommonly originate prolapsus ani. Also they frequently pass into the vagina, causing much irritation here, leading to catarrh, undue sexual excitement, or now and then severe hemorrhage. By getting under the prepuce they promote the habit of masturbation. On examination the worms may often be seen moving about the anus, as well as in abundance in the stools. Various reflex symptoms, similar to those associated with the other worms, are said to be due to threadworms, but this is doubtful.

The *tricocephalus dispar* does not give rise to any symptoms.

PROGNOSIS.—Most worms may be readily got rid of if properly treated. Tapeworms are sometimes difficult to remove completely, but with systematic management a cure may almost always be effected. It is safest to see that the head of a tapeworm is discharged, else, if this remains, a further growth will probably take place; however, it is affirmed that if only the head and a small portion of the neck is left the worm will die; and further, the nearer the head any portion is which is detached, the more easily will the rest be got rid of. Worms may now and then prove highly dangerous by their migrations, or by causing obstruction of the bowels; death may also occur from reflex convulsions excited by them.

TREATMENT.—If worms are present, of course the first object in treatment is to get them expelled. The remedies for this end must vary with the nature of the parasite. For tapeworm the following plan of treatment is usually efficacious: To let the patient take only liquids, such as milk and beef tea, for a day, then to administer a full dose of castor oil in the evening, and finally, early on the following morning, if the oil has acted well, to give a draught containing the *liquid extract of male fern*, in a dose of 10 drops to ʒi or ʒiss., according to age. The draught may be made up with sugar, mucilage, and milk, or with the yelk of an egg and cinnamon-water. The object of this plan is to clear out the bowels so as to expose the worm, and then the male fern acts upon it and kills it. Sometimes it is desirable to follow this up by another dose of castor oil, but generally this is not needed, as the drug itself acts as a purgative. Some authorities prefer the powdered fern. In order to see whether the head is discharged, each stool must be received into a separate vessel, then mixed with water and filtered through coarse muslin.

Other anthelmintics employed for the destruction of tapeworms are *kousso*, followed by a cathartic; *kamela* powder (ʒi to ʒiij in treacle or syrup) ; decoction of the bark of the root of *pomegranate* (℥ij in Oj, boiled down to Oss.); powdered *areca nut; oil of turpentine* (ʒi to ℥ss.) ; and *petroleum* (♏xx to xxx). If the worm projects through the anus, it has been recommended to roll it gradually round a piece of stick, and thus draw it out, or to apply some poisonous agent to the protruded portion.

For roundworms the most efficient remedy is *santonin*, which is the active principle of the popular worm-seeds. It is well before administering it to give an aperient, such as a little jalap with scammony, and to limit the diet to liquids for a day. Santonin may be employed alone, in doses of from 1 to 5 grains every morning for 2 or 3 days, in sugar or syrup, or made up into lozenges or with ginger-bread. It seems to be more efficacious when mixed with castor oil, and Küchenmeister advises that from 2 to 4 grains be dissolved in ℥i of the oil, and ʒi taken every hour until it acts. Other preparations used, containing santonin, are an ethereal extract of worm-seeds and santonate of soda. Mucuna and powdered tin are also employed for the expulsion of roundworms, which act by mechanical irritation: some rely merely upon strong purgatives.

Santonin is also useful internally for threadworms, but these are decidedly best got rid of by means of injections, of which many kinds have been employed. Any of the following will answer well, viz.: Common salt and other alkaline salts dissolved in water or gruel (ʒi to Oj); santonin with castor oil; infusion of quassia; infusion or decoction of wormwood; tincture of steel (ʒi to Oj of water or infusion of quassia); olive oil; lime-water; decoction of aloes; decoction of rue; or even mere water, if employed freely for a few days. Cleanliness is of great importance.

The *tricocephalus* requires no special treatment.

In all cases of worms it is essential to look to the state of the general health, and improve this by means of steel and other tonics, cod-liver oil, if required, as well as by attention to diet and hygienic measures. Also the alimentary canal must be attended to and the bowels kept freely acting, so as to prevent accumulation of unhealthy mucus. Scammony, jalap, rhubarb, and castor oil are the best aperients in these cases, and the powders may be advantageously mixed with carbonate of soda or magnesia.

The *prevention* of worms is a matter of considerable importance in some parts of the world, especially as regards tapeworms, and this can only be effected by taking every precaution against those habits mentioned under the etiology, by which the ova are conveyed into the stomach, such as eating raw or partially cooked meat, putting knives into the mouth, drinking impure water, &c. Stools known to contain any kind of worms or their ova should be immediately destroyed. Of course any meat that is measly ought on no account to be consumed. In children important prophylactic measures against worms are the maintenance of good health, keeping the digestive organs in a satisfactory condition, and attention to cleanliness.

TRICHINOSIS.

It will be convenient to consider in the present chapter a disease due to the entrance into the body of a parasite named *trichina spiralis*. It is very rarely met with in this country, but is not uncommon in some parts of the continent, where it occurs sometimes as an epidemic.

ETIOLOGY AND PATHOLOGY.—Trichinæ are introduced into the human body solely by eating pig's flesh in which they exist, either in a raw or imperfectly cooked condition, or in the form of pickled and smoked articles, sausages, &c. When this reaches the stomach and bowels, the parasites are liberated, and develop with great rapidity, the females being far the more numerous and larger, and forming an immense number of young trichinæ, which perforate the intestinal wall, migrate along the mesentery to the spine, and then all over the body, entering the muscles, penetrating even the sarcolemma. These are their habitat, and here they set up inflammatory action, becoming surrounded by a capsule or shell. It is supposed that there are several productions of young in the alimentary canal, with subsequent migrations.

ANATOMICAL CHARACTERS.—In man trichinæ at first excite gastro-enteric catarrh, often attended with enlargement of the mesenteric glands. After about the fifth or sixth week the muscles are seen to present under the lens fine striæ or minute dots, of a grayish-white and opaque aspect, which are collections of the parasite, contained in capsules or cysts produced by their irritation. These become more abundant as the case advances, and are chiefly observed in the muscles of the loins, diaphragm, intercostals, muscles of the neck, eye, larynx, and tongue. In the limbs they are mainly found in those nearest the trunk, and they are most numerous near their tendinous attachments. The affected parts feel unusually firm and resistant. On microscopic examination the muscular fibres are seen to be more or less destroyed, and the interstitial connective tissue increased. Each little cyst is somewhat ovoid, at first transparent, but soon becoming thicker and more opaque, and ultimately calcifying. The trichina is coiled up in it, and is very minute, the female being larger than the male. The head is finely-pointed, unarmed, with a minute mouth in the centre. In fatal cases, extensive bronchitis, pulmonary congestion or inflammation, venous thrombosis, and parenchymatous degeneration of various organs are frequently observed.

SYMPTOMS.—Trichinosis generally begins with symptoms of more or less gastro-enteric disorder, such as pressure and fulness in the epigastrium, impaired appetite, discomfort after eating, nausea or vomiting, eructations, colicky pains, and diarrhœa, with a feeling of much languor and depression ; in some cases the onset is characterized by violent sickness and purging, simulating cholera or irritant poisoning. Occasionally the disease sets in quite insidiously, with merely a feeling of lassitude and depression, wandering pains, and stiffness in the limbs. The subsequent characteristic symptoms are those dependent upon the condition of the muscles. Those of the limbs which are affected become painful, tender, swollen, hard, and rigid ; there is much stiffness, movement being greatly impaired, and the joints are fixed in a state of more or less flexion, any attempt to extend them causing much pain. From implication of various muscles result attacks of severe dyspnœa, aphonia, trismus, dysphagia, impaired movement of the tongue, &c. A peculiar œdema is also observed, affecting the face and eyelids, and extending in the limbs from the upper part towards the hands and feet.

Symptomatic pyrexia accompanies this condition, often severe, the temperature sometimes rising to 106°, and the pulse to 120° or 140°; abundant clammy perspirations may be observed, and occasionally miliaria. In cases tending to a fatal issue, low, typhoid symptoms set in, frequently with signs of bronchitis, pneumonia, &c. If recovery ensues, the muscular symptoms subside, as well as the pyrexia, but convalescence is protracted usually, there being much debility, anæmia, and œdema for a considerable time.

DIAGNOSIS.—Trichinosis may, in severe cases, be mistaken at first for cholera or poisoning. It may also simulate typhoid fever. After a time the symptoms referable to the muscles are quite characteristic.

Treatment.—To prevent the disease, meat containing trichinæ should be avoided, and microscopic examination of pig's flesh is employed in some parts of the continent before it is allowed to be sold. In order to be safe, the best plan is never to eat any pig's flesh which has not been thoroughly cooked. In the treatment of the disease, a matter of the first importance is to get rid of the trichinæ in the alimentary canal by means of castor oil or some other aperient, which may be given even though there is diarrhœa. Benzine, carbolic acid, and other remedies have been administered, with the view of destroying the parasites, but it is doubtful whether they succeed. The general treatment must be supporting, with quinine and stimulants. Hot and anodyne fomentations, or warm baths, relieve the muscles most effectually.

CHAPTER XXXIX.

DISEASES OF THE LIVER AND ITS APPENDAGES.

Clinical Characters.—1. *Morbid sensations* connected with the liver are referred mainly to the right hypochondrium, but may extend across the epigastrium to the opposite side, or shoot in various directions. They include different kinds of pain, with or without tenderness, or merely a sense of uneasiness, fulness, weight, and heaviness. Sympathetic pains in the right shoulder are very common.

2. Some important symptoms result from *disturbance of the biliary functions*, the chief being those associated with *jaundice*, under which they will be discussed. Bile may be secreted in excess, or be of improper quality, and thus act as an irritant, causing bilious diarrhœa and vomiting.

8. *Obstruction of the portal circulation* leads to mechanical congestion of its tributary veins. The obvious clinical phenomena resulting from this are those indicating gastro-intestinal disturbance, with catarrh and its consequences; hemorrhage into the alimentary canal; distension of the superficial abdominal veins; ascites; enlargement of the spleen; and hæmorrhoids. After death the veins within the abdomen are often found much enlarged and varicose, and the organs presenting the usual morbid changes which follow long-continued venous congestion.

4. If the liver is enlarged, it sometimes gives rise to symptoms by *pressing upon neighboring structures*, such as the diaphragm, vena cava, or duodenum.

5. *Physical examination* of the liver may demonstrate either displacement, alteration in shape, enlargement, contraction, or alteration in its characters on palpation. The *general characters* of *hepatic tumor* are as follows:

(i.) Its site corresponds mainly to that of the liver, or there is a history of its having grown from this direction; it does not descend into the pelvis, but *can be traced within the margin of the thorax*, and appears *superficial;* sometimes it is distinctly *visible*, or bulges out the lower part of the chest. (ii.) Though the dimensions may be very great, yet, as a rule, the *normal general outline* of the liver can be traced more or less distinctly; while the sensations on palpation are often sufficiently characteristic. (iii.) The organ is somewhat movable on manipulation, but not to any marked extent. (iv.) On percussion there is absolute dulness, with considerable sense of resistance generally; the dulness can be traced upwards towards the chest, and may have the curved outline said to be characteristic of the liver; it is, however, influenced by different degrees of distension of the stomach and bowels. (v.) The movements of the diaphragm are often interfered with, especially on the right side, but the liver is generally altered in position by deep breathing. (vi.) Posture may influence the organ also, it being more prominent and lower in the abdomen in the standing posture.

6. Occasionally the gall-bladder presents an enlargement, with the following characters: (i.) It occupies generally the right hypochondrium, and can be felt coming from under the margin of the liver, appearing to be superficial; occasionally, however, it is so much enlarged as to extend down to the crest of the ilium. (ii.) As a rule the shape is pyriform, with the base towards the surface. (iii.) The surface is generally smooth, and has an elastic or fluctuating feel. (iv.) Almost always the tumor is very movable from side to side, turning on a fixed point, which is under the liver; even a change of posture may alter its position considerably. Now and then it is fixed by adhesions.

HEPATALGIA.

The occurrence of intermittent attacks of severe pain in connection with the liver has been attributed, especially by Dr. Anstie, to a simple neuralgia in some instances. This affection is but a part of a general nervous condition, attended with similar pains in other parts, and deep mental depression. The attacks are not accompanied with vomiting, but it is said there may be jaundice. The main difficulty in diagnosis is to separate this pain from that due to the passage of a gallstone.

JAUNDICE—ICTERUS.

Jaundice is another of those symptoms which has been dignified by being described as a special disease. Essentially it merely means the peculiar discoloration of skin and other structures, which is observed when the bile-pigments accumulate in the blood.

ETIOLOGY AND PATHOLOGY.—Cases of jaundice have long been divided into (*a.*) Those in which there is a *mechanical obstruction* to the escape of the bile through the ducts. (*b.*) Those in which there is no such obstruction.

1. *Jaundice from Obstruction.*—This may be due to: (*a.*) *Impaction of some foreign body in the hepatic or common bile-duct*, viz., *gallstones*, thickened or gritty bile, rarely parasites, either formed in the liver or its duct (distoma hepaticum* and hydatids), or having entered from the intestines (roundworm), very rarely fruitstones or other bodies which have passed into the duct from the bowels. (*b.*) *Catarrh* of the mucous membrane of the ducts, or of the duodenum about the orifice, causing narrowing of the calibre. (*c.*) *Organic changes* in the walls of the duct or at the orifice, leading to more or less stricture, even to complete obliteration, viz., congenital constriction or closure, thickening of the walls from inflammatory changes, perihepatitis, cicatrization of an ulcer either in the duct or duodenum. (*d.*) *Pressure* upon the duct, *invasion of its canal*, or *closure of its opening* by tumors, &c., especially by projecting growths from the liver, enlarged glands in the portal fissure, and pancreatic disease involving the duodenum; rarely by pyloric tumor, growths in or behind the peritoneum, hepatic aneurism, fecal accumulation in the colon, uterine and ovarian enlargements including pregnancy and renal tumors. (*e.*) *Functional disturbance* of the muscular coat of the duct, in the way of spasm or paralysis (?).

Physiologists differ in their views as to how the bile is secreted, and this influences the opinions as to the pathology of jaundice in these cases of obstruction. It is generally maintained that both the bile-acids and pigments are *formed in the liver;* some believe, however, that the latter are *produced*, either partly or entirely, *in the blood*, and merely *separated by the liver.* Hence arise the two theories: 1. That the discoloration of jaundice is due to *excessive absorption of the bile by the veins and lymphatics after its formation.* 2. That it results from *suppression* of its secretion, and hence retention of the pigment in the blood. The former is probably the correct view, and the intensity of the jaundice will be in proportion to the rapidity with which the secretion of bile is going on, and to the slowness of its decomposition in the blood. Absorption is always proceeding during health, but the bile thus taken up is speedily changed in the process of nutrition.

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* The *distoma hepaticum*, or liver-fluke, is a small trematode worm, often found in sheep, very rarely in the human being, occupying either the gall-bladder or bile-ducts. It is of a flattened, elongated, oval form, soft, and brownish or yellowish in color.

2. *Jaundice without Obstruction.*—The conditions under which this variety is supposed to occur are: *a.* In certain *specific fevers*, viz., yellow, remittent, intermittent, and relapsing fevers; very rarely in typhus, typhoid, or scarlatina. *b.* When certain *poisons* are present in the blood, especially in connection with pyæmia, snake-bites, poisoning by phosphorus, mercury, copper, or antimony, inhalation of chloroform or ether. *c.* In acute or chronic *atrophy* of the liver or destruction of its tissue from any cause. *d.* In *congestion* of the liver. *e.* From *disturbed innervation*, especially after sudden intense mental emotion. *f.* When the *blood is insufficiently aerated*, as in pneumonia, new-born infants, or as the result of overcrowding and bad ventilation. *g.* Where bile is formed in much excess. *h.* In cases of habitual or long-continued constipation. *i.* In certain states of the portal system of veins, as when they contain abundant pigment granules, or are unusually empty after profuse hemorrhage from the alimentary canal. *j.* As an epidemic.

Before mentioning the various explanations given of the occurrence of jaundice under the above circumstances, I cannot but express my agreement with those who consider that in many of these cases it results from obstruction, at all events to some degree, which may arise from pressure upon the smaller ducts within the liver, catarrh of the main ducts, or the formation of plugs of mucus. The views suggested by different writers as to the pathology of the various forms of non-obstructive jaundice are, that it is dependent upon : 1. Suppression of secretion. 2. Increased absorption, so that more bile enters the blood than can undergo decomposition, either from excessive secretion, undue retention of bile in the intestines owing to constipation, or diminution of pressure in the portal vessels. 3. Impaired and delayed metamorphosis of the bile elements in the blood, and some think that the bile-acids are converted in this fluid into bile-pigments, owing to imperfect oxidation. 4 Conversion of the hæmatin of the blood into bile-pigments. With regard to the influence of nervous disturbance in producing jaundice, it is presumed that this may affect the activity of the secretion, the state of the portal veins, or the rapidity of the changes in the blood.

Jaundice is by no means a necessary accompaniment of even grave organic disease of the liver itself, and, in such cases, when it is very marked it generally results from some projection from the organ interfering with the main ducts, or from the glands in the fissure being involved. It may be due to destruction of the liver tissue, or to the ducts or the circulation in the interior of the organ being interfered with.

ANATOMICAL CHARACTERS.—In jaundice not only are the skin and conjunctivæ more or less stained with bile-pigment, but also most of the other tissues, organs, and fluids of the body, as well as morbid exudations and effusions. In the skin the pigment exists chiefly in the rete mucosum, also involving the sweat-glands considerably. The nerve-tissues are but slightly affected, and the general mucous membranes with their secretion still less. The bile-pigments are found in the clot and serum of the blood, but not the acids; in prolonged cases coagulation is imperfect, and the corpuscles are altered in their characters, while not uncommonly there are extravasations of blood. In cases of obstructive jaundice the liver itself becomes at first enlarged uniformly, without any alteration in shape, and mottled of a more or less deep yellow tint, in some cases being olive green; its ducts are distended, and in time numerous particles of pigment are seen in the cells. Should the obstruction be in the common duct, the gall-bladder will be enlarged. If the obstruction is persistent, the liver undergoes degeneration, becoming atrophied, very dark, sometimes almost black, and softened, many of its cells being destroyed, leaving only a granular detritus under the microscope. The kidneys also are much changed in prolonged cases, being deeply colored, their tubules containing a black or brown deposit, and their secreting cells presenting granules of pigment, or ultimately breaking down.

SYMPTOMS.—The most obvious clinical indications of jaundice are those derived from the *external discoloration*, the *urine*, and the consequences of *absence of bile from the alimentary canal*. Usually the first signs are afforded by the urine, next by the conjunctivæ, and then by the skin. The conjunctivæ are more or less deeply tinged yellow. The skin may present a variety of tints, from a faint yellow to a brownish or blackish-green. The color is deepest where the epidermis is thin, and varies with age, complexion, amount of fat, &c. If the lips or gums are pressed, so as to expel the blood, a yellowish hue is often observed. The urine has a color ranging from a light saffron-yellow to one resembling mahogany or porter; on standing it usually becomes greenish. Its froth is yellow, and it will tinge white linen or blotting-paper dipped into it, often staining the underclothing. *Chemical examination* is most important, as indicating the presence of bile-pigments, and, as many believe, of bile-acids. The former is tested for by nitric acid. Either a few drops of urine and acid may be placed on a white porcelain surface, and allowed to come into contact; or a little urine may be poured intó a test-glass, and the acid allowed gently to run down its interior, so as to sink to the bottom. A play of colors is observed, to violet, green, blue, and red, these soon disappearing. The bile-acids are detected by Pettenkofer's test, viz., by adding a fragment of lump sugar to a little urine in a test-glass, and then pouring in a small quantity of strong sulphuric acid, drop by drop, allowing it to trickle down the side of the tube. A deep purple color is produced where the acid and urine meet. Dr. George Harley and others affirm that the bile-acids are only present in the urine in cases of *obstructive* jaundice, and not in that due to *suppression;* also that they may disappear in prolonged cases of the former owing to destruction of the liver tissue. Another important character is, that the urine often contains leucin and tyrosin, crystals of which may be seen under the microscope after careful evaporation of some of the excretion to a syrupy consistence. In some cases the quantity of urine is deficient at first; the reaction is acid; the proportion of urea and uric acid varies, and they may be in excess. In advanced cases sugar sometimes appears. Renal epithelium or casts tinged with biliary coloring matters are occasionally observed.

When the bile does not reach the intestines, the consequences are constipation, with unhealthy stools, these being deficient in coloring matters often pale-drab or clay-colored, dry, offensive, and containing excess of fat; formation of much foul gas from decomposition, with consequent flatulence, and passage of fetid flatus. Occasionally diarrhœa is observed from time to time, or dysenteric symptoms. There is usually a disinclination for food, especially for fatty matters, and eructations are common, which may have a bitter taste. Evidence of the presence of bile is often afforded by the sweat, milk, saliva, and tears. From the accumulation of bile acids in the blood result not uncommonly cutaneous itching, which may be very distressing; slowness of the heart's action and pulse, which may fall to 50, 40, or even 20 per minute; as well as a feeling of languor, depression, and debility, lowness of spirits, with incapacity for exertion, irritability, and drowsiness. The symptoms last mentioned are also partly due to the emaciation and impaired nutrition, which usually become soon apparent, in prolonged cases being very marked. In some instances urticaria, lichen, boils, carbuncles, or petechiæ are observed. Yellow vision (xanthopsy) is an extremely rare phenomenon, and its cause is very uncertain.

Jaundice, especially the non-obstructive variety, may be accompanied with symptoms indicative of the "typhoid state," low nervous symptoms, or dangerous hemorrhages, particularly from the stomach and bowels, ending speedily in death. It is important to observe that these phenomena are often quite out of proportion to the intensity of the jaundice. They have been attributed to the accumulation in the blood of bile-acids, of cholesterin, of products resulting from the decomposition of bile-acids or their formative elements, or of some noxious substance formed in the cells of the liver; or to the metamorphosis of materials in the process of preparation for excretion by the urine being checked or modified, owing to a deficiency of bile, which is required for these changes; so that instead of urea and such compounds, intermediate products are formed, which collect in the blood and act as poisons. Might it not be that, in some of these cases at all events, the above symptoms are independent of the jaundice, and result from some general morbid state, or some condition of the kidneys, which leads to blood-poisoning?

Physical examination will probably, in cases of obstructive jaundice, reveal in a short time enlargement of the liver, not great, and quite regular. If the common duct is obstructed, the gall-bladder may also present a fluctuating enlargement. In prolonged cases the liver may ultimately afford the physical signs of atrophy.

The course, duration, and intensity of jaundice vary greatly, according to its cause. It may be merely a slight temporary disturbance, or permanent and extreme in degree.

Diagnosis.—The first matter is to be certain that there is jaundice. The discoloration of the skin might possibly be simulated by a chlorotic tint, the cachexia of chronic lead-poisoning, malaria, or cancer, the color associated with suprarenal disease, or bronzing from exposure to the sun. The conjunctivæ and urine should always be particularly examined. It must be remembered, however, that the yellowness due to the collection of fat under the conjunctiva may be mistaken for that of jaundice. Also pigments form in the urine sometimes, which render it very dark; and now and then malingerers purposely stain the skin and add coloring matters to the urine.

It may be difficult to determine whether jaundice is of the obstructive or non-obstructive variety, but the latter, as well as its particular cause, may be generally recognized: *a.* By the circumstances under which it occurs, and the other symptoms which accompany it. *b.* By the discoloration being less marked. *c.* By the presence of more or less bile in the stools. *d.* By examination of the urine, which, as already stated, according to Dr. G. Harley, gives indications of the presence of bile-acids only in the obstructive form of jaundice, though many deny this, and which in the non-obstructive variety yields leucin and tyrosin.

The precise cause of obstructive jaundice is determined by—*a.* The age, sex, habits, and general past history of the patient. *b.* The preceding and accompanying symptoms, both local and general. *c.* The rapidity with which the jaundice has set in and its intensity. *d.* Careful physical examination of the abdomen. *e.* The course and progress of the case and the effects of treatment. Intelligent attention to these points will generally lead to a correct opinion. The more rare causes can only be made out by exclusion, and are often merely guessed at. The fact of the gall-bladder being enlarged or not, will as a rule show whether any obstruction is in connection with the hepatic or common bile-duct.

Prognosis.—In most cases the prognosis of jaundice depends rather on the morbid condition with which it is associated than on this particular symptom. As a rule, therefore, it may be stated that non-obstructive jaundice is much the more grave. Typhoid and low nervous symptoms are highly dangerous, as are also hemorrhages, and signs of interference with the renal secretion. In obstructive cases not only will the prognosis vary with the cause of the jaundice, but also with the rapidity with which it comes on, its intensity and mode of progress. *In every case a cautious prognosis should be given,* as it is never certain how it may turn out, and this is particularly true if jaundice sets in rapidly and becomes speedily intense.

Catarrhal jaundice generally soon disappears. Of course when it is due to obstructive organic disease, especially cancer, there is no hope of recovery, but it is astonishing what an extreme degree the discoloration may attain in some instances, without any proportionate general disturbance to lead to the idea that bile acts as a poison. Jaundice in pregnancy is considered highly dangerous.

TREATMENT.—In general terms the management of cases of jaundice may be summed up thus: 1. To treat the condition upon which it depends, and remove any obstruction to the flow of bile, if practicable. 2. To promote secretion of bile, if necessary, by remedies to be hereafter considered; or on the other hand to limit its formation. 3. To attend carefully to the diet, especially avoiding fatty and oily substances, as well as much starch, sugar, or alcoholic stimulants. 4. To treat the symptoms due to the absence of bile from the alimentary canal, especially constipation and flatulence; or to supply a substitute for this secretion in the way of artificially-prepared inspissated ox-gall, in from 5 to 10 grain doses, given 2 to 3 hours after meals. 5. To promote the renal and cutaneous secretions. 6. To attend to the general condition, giving quinine, iron, and other tonics, and also adopting hygienic measures for improving the health, in chronic cases; treating adynamic symptoms by stimulants; low nervous symptoms by encouraging free elimination by the bowels, kidneys, and skin; hemorrhages by astringents. In cases of permanent obstruction, it has been proposed to make an artificial fistula into the gall-bladder, having first excited adhesion with the abdominal wall by means of escharotics. The irritation of the skin may demand measures for its relief; alkalies and opiates or morphia internally, or the latter hypodermically, and warm and alkaline baths are most serviceable for this purpose. It must not be forgotten that the color of jaundice remains for a time after any cause of obstruction has been removed; and if this has been effected, it is not necessary to continue further active measures. The removal of the bile from the system may be promoted by occasional alkaline baths, aperients, Cheltenham and other mineral waters, while convalescence is promoted by hygienic and other measures for improving the health.

CHAPTER XL.

CONGESTION OF THE LIVER—HYPERÆMIA.

ETIOLOGY.—*Active* hepatic congestion occurs to some degree during every period of digestion. As a morbid condition it is met with: 1. After errors in diet, especially habitual excess in eating or indulgence in too rich articles, abuse of alcohol or hot condiments, particularly in those who take but little exercise. 2. As the result of continued exposure to excessive heat in tropical climates, or of a sudden chill while heated. 3. In connection with malarial, yellow, relapsing, and other fevers. 4. Vicarious of menstruation, or, it is said, of other habitual discharges, *e. g.*, bleeding from piles. 5. As the result of injury. 6. Associated with morbid deposits in the liver and the early stage of inflammation.

Mechanical congestion is generally due to some condition of the heart or lungs, which interferes with the general venous circulation; very rarely to local obstruction of the hepatic vein or inferior vena cava.

Passive congestion is said to follow habitual constipation, or to result from a torpid state of the portal system, from paralysis of coats of the vessel, or any other cause.

ANATOMICAL CHARACTERS.—It is only the mechanical form of congestion that is generally seen after death. The liver is enlarged more or less, quite uniformly, its surface being smooth, and the capsule stretched. It often feels unusually firm. On section an excessive quantity of blood flows, the color of the surface is dark, sometimes even purple, and the vessels appear abnormally filled, being in time dilated. The dark color is rarely uniform, but appears chiefly in connection with the intralobular branches of the hepatic veins, constituting the so-called hepatic congestion. Portal congestion is the term applied when the vessels at the circumference of and between the lobules are most distended, but it is rarely seen. The ultimate effects of *long-continued mechanical congestion* will be described in a later chapter, but allusion may be made here to what is termed the "nutmeg liver. It is thus named from a section presenting a variegated appearance, resembling that of a nutmeg, there being a mixture of re white, and yellow tints. This condition is observed after congestion from cardiac obstruction has lasted for some time, and essentially depends on the following pathological changes. Th branches of the hepatic vein are distended and overloaded, de red and well defined; the circumference of the lobules corresponding to the portal branches is anæmic, and has undergone degenerative fatty changes, hence being pale and opaque; while t bile is stagnant in many of the smaller bile-ducts, by which t yellow tint is produced.

SYMPTOMS.—Locally congestion tends to produce a sense uncomfortable tension, fulness, and weight, especially after meals and when lying on the left side; sometimes there is slight tenderness. There may be pain in the right shoulder. Slight jaundice is often present, but the stools contain bile. The spleen becomes enlarged in time. Commonly the alimentary canal is deranged as evidenced by impaired appetite, foul tongue, constipation or diarrhœa, and flatulence; but this is often the result of the same cause which produces the hepatic congestion, though it may be partly due to deficient or unhealthy bile. Some general disturbance often accompanies the congestion. The urine is frequently deficient and concentrated, depositing abundant urates; it also commonly contains biliary coloring matter.

The *physical signs* of congested liver are moderate enlargement, liable to some variation; regularity and uniformity in shape, and as regards surface and margins; with frequently somewhat increased firmness.

TREATMENT.—For active congestion the measures to be adopt are—to remove its exciting cause, an emetic being useful if it due to irritating articles of food; to restrict the diet to quantities of beef tea, milk, and such articles; to apply w poultices, fomentations, or sinapisms over the hepatic region, cup freely, or, in some cases, to remove a little blood, by lee or cupping, or by applying a few leeches around the anus; give a dose of calomel or blue pill, followed by saline ape such as citrate of magnesia, sulphate with carbonate of ma sulphate of soda, or cream of tartar. After the acute symptoms have subsided, alkalies with bitters are useful, as well as alkaline and saline mineral waters; and subsequently the principles of treatment must be similar to those described hereafter in connection with chronic hepatic diseases. These will also apply to cases of mechanical congestion.

ACUTE INFLAMMATORY AFFECTIONS OF THE LIVER.

I. Circumscribed or Suppurative Inflammation—Hepatic Abscess.

Etiology and Pathology.—The usual form of acute inflammation of the liver-tissue is that which ends in suppuration, and even this is rare, except in tropical climates. The cases seen in this country are principally among sailors and others who have come from these regions. Murchison distinguishes two forms of hepatic abscess, the *tropical* and *pyæmic*, the latter occurring in temperate climates.

The general causes of acute hepatic inflammation may be stated as follows: 1. Occasionally direct injury to the liver, or over the hepatic region. 2. Convection of septic matters from various parts of the body, either internal or external, the products of wounds, operations, abscesses, ulcerations, gangrene, &c. The deleterious substances may come from any part, but hepatic abscess is especially frequent after ulceration or gangrene of the stomach or bowels, as the result of operations affecting the alimentary canal, and in connection with ulceration or suppurative inflammation about the bile-ducts or gall-bladder, because then the materials are immediately taken up by the portal system of vessels. Some are of opinion that in these cases the disease originates in phlebitis, extending along the portal vessels to the liver. 3. An embolus or thrombus in the portal vein sometimes softens and breaks down (suppurative pylephlebitis), and the particles may be conveyed into the liver and originate an abscess there. 4. Rarely some direct irritation in the substance of the liver, *e. g.*, a suppurating hydatid cyst, gallstones, roundworms which have entered through the ducts, or foreign bodies. 5. The etiology of *tropical* cess requires special comment. It has been regarded by Bud[illegible]d others as in all cases essentially *pyæmic*, resulting from pr[illegible]re-ous *dysentery*. In some instances it is highly probable that th[illegible]is the true pathology, but by no means in all, for there is often [illegible] no ign of dysentery. There are two views as to the *exciting cau[illegible]ses* of the inflammation in these cases: *a*. That it is the *direct con[illegible]se-quence* of *continued intense heat*, combined with *malarial influen[illegible]ce*. *b*. That in addition to these influences, which induce a *predisp[illegible]os-ing* depraved condition of system, there must be a *sudden ch[illegible]ill*. Intemperance, excessive eating, indolent and luxurious hab[illegible]its generally, act as powerful predisposing causes.

Anatomical Characters.—The post-mortem examination in acute hepatitis generally reveals suppuration. It is supposed to commence with active hyperæmia, followed by effusion of ly[illegible]ph and degeneration of the hepatic cells, causing the affected part to become swollen or prominent, paler, yellowish and softened; then suppuration begins in points in the centre of the lobules, which gradually coalesce, forming abscesses of various sizes. The pus-cells are probably partly leucocytes, partly the products of endogenous multiplication of the liver-cells. The situation, number, size, and exact shape of the abscesses vary widely, as well as the nature and amount of their contents, and the condition of the surrounding tissue. The right lobe is much more frequently affected than the left. Important differences as to number and size are stated to be observed between *tropical* and *pyæmic* abscesses. In the former case there is generally *one large* abscess, and rarely i the number above three; in the latter the separate accumulatio of pus are very numerous and small, not often being abov hen's egg in size. My own limited experience of these c would lead me to the conclusion that there are at least excep to this rule.

Originally hepatic abscesses are more or less rounded, l coalescence and extension they often become very irregula contents resemble generally healthy pus at first, but in ti may be sanguineous or altered by admixture of bile, or less fetid and decomposed. At first the walls consist tissue, usually congested, or infiltrated, softened, and in time the boundary may become converted into a smooth, firm capsule.

The progress and termination of these abscesses are variable also. When large, and especially of the tropical variety, they tend towards the surface or in some other direction, finally bursting externally, into the peritoneum, intestines, stomach, gall-bladder, hepatic duct, hepatic or portal vein, inferior vena cava, pelvis of right kidney, or, rarely, through the diaphragm into the pleura, lung, or pericardium. After the discharge of the pus, cicatrization may take place, causing contraction and depression of the surface of the liver. In some cases an abscess remains dormant for a considerable period, and then rapidly increases. It is believed also that the fluid portion of the pus may be absorbed, the contents becoming caseous, then putty-like, and finally calcareous, the tissue around forming a dense cicatrix.

The gall-bladder is sometimes inflamed. The bile in it is frequently unhealthy, but presents no special characters. The consequences of the rupture of an abscess into various structures are described in other parts of this work.

SYMPTOMS.—As a rule these are very prominent.

Local.—Pain and tenderness are generally complained of over some part of the hepatic region, often preceded by mere uneasiness. The pain differs much in its severity and characters; in most cases it is at first dull, aching, and tense, but usually increases as suppuration occurs, and may then become throbbing; it is more marked when the inflammation is near the surface. Sympathetic pains about the right shoulder and scapula are occasionally present, but, it is stated, only when the upper surface of the right lobe is affected. Then also a deep breath or cough aggravates the pain, and the breathing is hurried, short, chiefly upper costal, while there is some sense of dyspnœa, with often a short, dry cough. Jaundice is very uncommon in connection with tropical abscess, but some degree of it is frequently observed in pyæmic cases. Ascites is extremely rare, unless the inflammation depends on pylephlebitis, when signs of great obstruction of the portal vein are prominent, and this is important in diagnosis. More or less disturbance of the alimentary canal is almost always observed, such as loss of appetite, furred and irritable tongue, thirst, nausea or vomiting, constipation or diarrhœa. The urine is at first very markedly febrile; after suppuration it often becomes pale, copious, and deficient in urea.

Physical Characters.—The liver is at first uniformly and moderately enlarged. Should the abscesses formed be small and deeply seated, as in pyæmic cases, nothing further can be observed; but if one or more of them become large and superficial, then the following characters are presented: *a.* The general enlargement increases considerably, and in addition a bulging prominence presents in some direction, or occasionally more than one. This is generally observed in the epigastrium or right hypochondrium; sometimes it causes distension of the lower part of the chest, with flattening of the spaces. *b.* The general surface and margins of the liver, as a rule, feel smooth and regular, but occasionally from the projection of several small abscesses, or on account of perihepatitis, they are undulated and irregular. *c.* The local bulging soon affords a sensation of elasticity, and then of *fluctuation*, gradually extending and becoming more perceptible, surrounded often by a ring of inflammatory induration. There is no "hydatid fremitus." *d.* The *hepatic dulness* is altered in outline as well as in area, and when the abscess tends towards the thorax, this is often one of the chief signs noticed. *e. Auscultation* may reveal friction-sound over an abscess, due to peritonitis. It may also indicate invasion of the chest, and interference with the expansion of the lung. *f.* By means of the *exploratory trocar* pus may be obtained, and this is important for diagnosis in doubtful cases. I may mention that *marked pulsation* may be observed in connection with an abscess presenting in the epigastrium, conducted from the aorta, and simulating aneurism. The spleen may be enlarged, but chiefly in pyæmic cases, and not as the direct result of the hepatic disease.

General Symptoms.—Chills or rigors often usher in an attack of acute hepatitis, followed by more or less pyrexia and considerable constitutional disturbance. Suppuration is usually indicated by repeated rigors, fever of a hectic type, not uncommonly remittent or intermittent, with abundant sweats and much prostration and wasting. Ultimately typhoid symptoms are very liable to arise, ending in low nervous disturbance and death. The constitutional symptoms are, as a rule, more severe in pyæmic than tropical cases.

The ultimate course of events will depend upon the progress of the disease. The symptoms may subside, and the abscess undergo retrograde changes, ending in cure. Almost always, however, it tends to open in some of the directions already mentioned, and the corresponding symptoms will be readily gathered from a little consideration. When it approaches the surface, it produces redness, œdema, and the other signs of superficial suppuration, before it bursts. Most of the cases of hepatic abscess are rapid in their progress, but tropical cases may last six months or more; pyæmic forms are much the more fatal and speedy in their termination. Some cases go on for a long period, and ultimately recover, the abscess discharging its contents and cicatrizing.

II. PERIHEPATITIS.

This term is applied to inflammation of the covering of the liver and Glisson's capsule, which is not uncommon as an acute affection, associated with peritonitis, or organic diseases of the liver, or resulting from injury or extension of inflammation from neighboring parts. It is also said to arise from a chill. It leads to exudation, with thickening, opacity, and adhesions; occasionally pus is formed. The *symptoms* are pain, sometimes sharp, increased by cough and deep breathing, with superficial tenderness, but no particular derangement of the hepatic functions, or alterations in the physical characters of the liver. There is usually more or less pyrexia. If it is chronic, or if there are repeated attacks, as not uncommonly happens in syphilis or chronic heart diseases, there may be signs of obstruction of the portal vein or bile-duct, with atrophy of the liver.

III. INFLAMMATION OF THE BILE-DUCTS.

Catarrh of the bile-ducts is by no means an uncommon affection, being especially met with in children and old gouty persons. Its chief causes are extension of catarrh from the duodenum; hepatic congestion; irritation of the mucous membrane by gallstones, parasites, foreign bodies, and perhaps unhealthy bile, which may cause considerable inflammation; and blood-poisoning in fevers and other affections. The morbid appearances are similar to those of other catarrhs. Occasionally croupous or diphtheritic inflammation is observed. The *symptoms* of simple catarrh merely indicate partial obstrution of the bile-ducts, with consequent jaundice and enlargement of the liver and gall-bladder, generally preceded by signs of gastro-duodenal catarrh. There is often local pain and tenderness, with some pyrexia. The duration and course of these cases vary much.

DIAGNOSIS.—The occurrence of acute local symptoms connected with the liver, with constitutional disturbance, should lead to the suspicion of inflammation, especially in tropical climates, or if there is any obvious cause of pyæmia. At first there may be considerable difficulty in distinguishing inflammation from mere active congestion, and also in separating the different kinds of inflammation from each other, especially suppurative hepatitis and perihepatitis. When pus forms, this is generally revealed by evident physical signs and increased constitutional disturbance. Commonly, however, distinct objective indications of pyæmic abscesses are wanting; the differences between these and tropical abscess have been already alluded to. The chief conditions which may be mistaken for abscess in the liver are inflammation and suppuration in the gall-bladder, a suppurating hydatid cyst, and abscess in the abdominal parietes.

PROGNOSIS.—In the milder forms of hepatic inflammation the prognosis is generally favorable, but when suppuration occurs it is very serious. It will then depend mainly on the size and probable number of the abscesses; the direction in which they open (Maclean stating as his experience that the largest number of recoveries follows bursting into the lung, and then into the intestine; and that the prognosis is much more favorable when the abscess points at the ensiform cartilage than in an intercostal space); the general condition of the patient; and whether the liver-affection is associated with other morbid states, such as dysentery. Pyæmic abscesses are very fatal.

TREATMENT.—The slighter forms may be treated in the manner described under congestion. Much difference of opinion is held as to the management of tropical abscess in its early stage. The usual measures recommended are venesection, or local bleeding by leeches or cupping; constant poulticing or fomentations; saline purgatives internally; and the administration of calomel. Dr. Maclean, who strongly opposes bleeding and mercury, advocates the free employment of ipecacuanha, as in dysentery. Tartar emetic and tincture of aconite have also been used. With regard to pyæmic abscess, there can be no question but that the severe lowering measures mentioned above are most injurious. When suppuration occurs, poultices and fomentations must be assiduously applied. The question of opening abscesses is one which is also much discussed. Most authorities seem to be in favor of operating; some prefer leaving the abscess to take its own course, on account of the dangers of peritonitis, decomposition from entrance of air, hemorrhage, or gangrene. If there is satisfactory evidence of the existence of a *single* abscess, it appears to me certainly advisable to let the matter out, and even in doubtful cases a small exploratory trocar may be sometimes employed. When there are *several* collections of pus, as in pyæmia, operative interference is contraindicated. The different modes of evacuation advocated are by puncture with a small trocar and canula; free incision; or application of caustic potash so as to produce a slough, this last being also used to excite adhesions to the abdominal wall. The air must be as carefully excluded as possible, and carbolic acid freely used. In the case of a moderate-sized abscess, it seems best to let out all the pus at once, and leave a canula or drainage-tube in; when very large, it may be emptied gradually by successive operations. Large poultices should be afterwards applied, being very frequently changed, and disinfectants freely used, the patient lying as much as possible in that position most favorable for the escape of the pus. It is useful in some cases to wash out the abscess with weak carbolic acid. In the early period of the disease the diet should consist of milk, beef tea, &c.; when suppuration is set up it should be as nourishing as possible, while stimulants are called for at this time, as well as quinine, mineral acids, or tincture of steel. Narcotics are often required, and various symptoms demand attention in many cases. The general treatment for pyæmia is indicated in pyæmic cases.

ACUTE YELLOW ATROPHY.

ETIOLOGY AND PATHOLOGY.—The causation of this rare disease is very uncertain. Most cases occur in connection with pregnancy, but it has also been attributed to severe nervous disturbance from depressing emotions; blood-poisoning in typhus, scarlatina, &c.; malarial influence; or to the production within the body of some special poison as the result of faulty digestion or assimilation. The chief *predisposing causes* mentioned are age, the disease almost always being observed before 40, but never in childhood; the female sex; intemperance; venereal excesses; and syphilis.

As regards the pathology, most authorities consider acute atrophy as being the consequence of diffuse *parenchymatous inflammation* excited by some poison. It has also been attributed to obstruction of the smaller bile-ducts, or to excessive formation of bile in them, whereby pressure is exercised on the surrounding structures.

ANATOMICAL CHARACTERS.—The obvious characters are marked diminution in size and weight of the liver, relaxation of tissue and softening, change in color to a dull yellow, and disappearance of any lobular divisions. The organ may be reduced to half its ordinary bulk, or even less, being especially diminished in thickness, and it lies back out of sight, shrunken and flaccid, while the peritoneum covering it is lax and often in folds. In parts where the disease is less advanced hyperæmia and a grayish exudation have been described. Microscopic examination reveals fatty degeneration and destruction of the gland-cells, until nothing remains but a granular detritis, oil-globules, and pigment. There is only a little mucus in the gall-bladder and ducts as a rule. Extravasations of blood in the alimentary canal and other parts, with ecchymoses, are not uncommon. The spleen is generally enlarged. The kidneys exhibit degeneration of, and deposits of pigment in, the epithelium cells. Leucin and tyrosin are found in the blood, as well as in the tissues of the liver, spleen, and kidneys.

SYMPTOMS.—There may or may not be premonitory symptoms of gastroenteric catarrh, or general uneasiness and painful sensations, but there is nothing characteristic about these. Slight jaundice is usually observed soon, and it afterwards increases, but seldom becomes intense, and it may be limited to the upper part of the body. It has been attributed to blocking-up of the smaller ducts by the débris of the cells. Among the usual symptoms are pain over the epigastrium and hypochondrium, with tenderness, vomiting, and constipation. There is not much pyrexia, but the pulse is often hurried and is liable to much variation, while the temperature is raised in some cases considerably towards the close.

The striking clinical phenomena in this disease, however, are those significant of the "typhoid state," with prominent nervous symptoms; great diminution or complete disappearance of the hepatic dulness; generally enlargement of the spleen; peculiar changes in the urine; and hemorrhages. The nervous symptoms are at first headache, great depression, languor, irritability, and restlessness, speedily followed by low delirium, stupor, coma, twitchings, convulsions, with involuntary discharge of fæces and urine. At the same time the tongue becomes brown and dry, with sordes on the teeth. The urine yields considerable quantities of leucin and tyrosin, while the urea, uric acid, and salts are much diminished, sometimes almost entirely absent; some bile-pigment is usually present, and often a little albumen or blood. Hemorrhage most frequently takes place into the stomach and bowels; cutaneous petechiæ and vibices are not uncommon, and, in rare instances, uterine hemorrhage or epistaxis occurs. The course of the disease is generally very rapid, and the termination fatal. When it arises in the course of pregnancy, it leads to miscarriage or abortion.

Diagnosis.—At first it is difficult to diagnose acute atrophy, but once the symptoms are fully developed, with the physical signs of diminution in the size of the liver, the nature of the case becomes evident.

Prognosis is very grave, the disease almost always ending fatally.

Treatment.—Free purgation, promotion of the action of the skin by hot air or vapor baths, diuretics, blistering and leeching the head, and cold douches, have been the chief measures recommended, but they are of little service when the disease is established. Hemorrhages and other symptoms must be treated as they arise.

CHAPTER XLI.

CHRONIC DISEASES OF THE LIVER.

Hypertrophy and Atrophy.

A *simple hypertrophy* of the hepatic tissue is said to be observed in some cases of leucocythæmia, very rarely in diabetes, and as the result of residence in hot climates. Clinically it is indicated by a slow, moderate, and uniform enlargement of the liver, without any evident symptoms.

On the other hand, *atrophy* generally occurs in old age, [illegible] may result from starvation, or pressure upon the surface of the organ by tight stays, peritoneal adhesions, &c.

FATTY LIVER—HEPAR ADIPOSUM.

ETIOLOGY.—As previously mentioned, this affection belongs to the *fatty infiltrations*, the secreting cells becoming filled with oil. The conditions under which it is usually met with are: 1. In phthisis and other wasting diseases, such as cancer, gastric ulcer, chronic dysentery. 2. In chronic lung and heart affections, leading to imperfect aeration of blood. 3. As the result of overfeeding, especially excessive consumption of hydrocarbonaceous substances, and abuse of alcohol, particularly in the form of ardent spirits. Deficient exercise and indolent habits aid greatly the development of the disease under these circumstances. Some individuals are much more predisposed than others. *Fatty degeneration* may be set up in connection with other morbid conditions of the liver, as albuminoid infiltration or cirrhosis.

ANATOMICAL CHARACTERS.—In well-marked fatty liver the morbid characters are, enlargement and increase in weight, though the specific gravity is diminished, the margins being thickened and rounded, and the surface quite smooth; a more or less yellow color with opacity, both externally and on section, generally mottled with red; softening of the tissue, which has a doughy, inelastic feel, pits on pressure, and readily breaks down or tears; anæmia, but little blood escaping from the cut surface; loss of distinctness of outline of the lobules; and evidence of the presence of much fat to the knife, blotting-paper, or ether. The liver may yield as much as 43 or 45 per cent. of oily matters, which consist of olein and margarin, with traces of cholesterin. Microscopic examination shows enlargement of the cells, which are spherical, and more or less loaded with fat. In the less advanced cases this alone can reveal the change. It is found that the morbid process extends from the circumference of the lobules towards the centre.

SYMPTOMS.—As a rule there are no evident symptoms connected with the liver. Dyspeptic disturbances are common. ***Physical examination*** is the only positive means of diagnosing fatty liver:

a. There is enlargement in a downward direction, slow in its progress, and usually moderate in degree, the organ never attaining any great size. *b.* The shape is quite normal, and the surface and margins are smooth and regular, the latter feeling rounded. *c.* Palpation often reveals a soft doughy consistence of the tissue. The general symptoms are frequently those associated with fatty changes, viz., want of tone, inaptitude for exertion, pallor and pastiness of the skin, &c. Signs of fatty changes in other organs and tissues, as the heart, vessels, and kidneys, may be observed.

ALBUMINOID, LARDACEOUS, OR WAXY LIVER.

For the *etiology* and *pathology* of this morbid condition, reference must be made to the chapter which treats of it generally. The liver is one of the most common seats of albuminoid deposit.

ANATOMICAL CHARACTERS.—Commonly size and weight are considerably increased, and also the specific gravity. Shape is scarcely altered, but the liver is somewhat flattened, with rounded edges. The surface and margins are quite smooth, the peritoneum stretched, and the tissue feels very firm and resistant. On section the usual pale, anæmic, dry, grayish, and glistening aspect of lardaceous disease is observed; often the surface is quite homogeneous, without any trace of lobules, or these may appear enlarged. The ordinary chemical tests are yielded, and microscopic examination reveals the presence of the deposit in connection with the vessels and cells. It is first observed in the middle zone of the lobules, where the branches of the hepatic artery are distributed. The exact appearances may be varied by the association of other morbid conditions, such as fatty degeneration, cirrhosis, or syphilitic cicatrices. The disease commonly involves other organs at the same time.

SYMPTOMS.—As a rule hepatic symptoms are not prominent. Local sensations rarely amount to more than a feeling of weight, tension, and discomfort. Jaundice and signs of obstruction of the circulation are also very uncommon, and when present are due either to pressure by enlarged glands in the portal fissure, or by thickenings in connection with local inflammatory changes; or, as regards ascites, to chronic peritonitis or constitutional debility and anæmia. The *physical signs* are: *a.* Enlargement, chiefly in a downward direction, gradual in its progress, frequently very great at last, so as to present a visible, prominent tumor. *b.* No perceptible alteration in form, the surface being smooth and uniform, with rounding of the margin. *c.* Consistence dense and resistant, often extremely hard. There are the usual *general symptoms* indicative of albuminoid disease, with, in most cases, signs of implication of other organs, as well as of the existence of some constitutional condition with which it is associated.

HYDATID TUMOR OF THE LIVER—ECHINOCOCCUS HOMINIS—ACEPHALOCYST.

ETIOLOGY AND PATHOLOGY.—The best illustration of the morbid conditions resulting from the development of the embryo of a tapeworm in the human body, is afforded by the complaint now under consideration, and though the parasite may be met with in almost every organ and tissue in the body, yet the liver is by far its most frequent seat, so that the subject may be treated once for all in the present chapter. A hydatid tumor is derived from the development of embryos of the *tænia echinococcus*, each of which produces a scolex, named *echinococcus hominis*, and then they become inclosed in cysts. This tapeworm infests dogs and wolves, and it is supposed that fragments are evacuated in the excreta, their ova are set free, become mixed with water or food, and are thus introduced into the alimentary canal of a human being. When the embryos are liberated they bore the walls with their hooks, and then migrate, usually settling in the liver, there developing into scolices. The echinococcus also infest sheep, and it is through eating their organs that dogs become the seat of the tapeworm.

Iceland is the country in which this disease is especially prevalent. In this part of the world it is only very exceptionally met with, and usually in those who have been abroad. Most cases occur during middle life, and among the poorer classes.

ANATOMICAL CHARACTERS.—In the first place it will be well to describe the various structures which ordinarily go to form a typical hydatid tumor: 1. Externally there is a firm, whitish or yellowish, fibrous vascular capsule, the result of proliferation of cellular tissue from irritation, adherent to the surrounding tissues. 2. Within this, moulded as it were to its interior but easily separated from it, is a delicate cyst or bladder, elastic, grayish, semi-transparent or gelatinous in aspect, and compared to boiled white of egg; under the microscope it is seen to consist of several hyaline, concentric layers, a section presenting a characteristic laminated appearance. The most internal layer is extremely delicate and studded with minute transparent cells. The term "mother-sac or vesicle," is usually applied to this structure as a whole; but it has also been limited to the internal lamina just mentioned, which has likewise been termed the "germinal membrane." 3. A quantity of fluid is contained within this cyst, usually completely filling it, perfectly colorless, transparent, and watery as a rule, occasionally slightly opalescent; of low specific gravity (1007 to 1009); generally alkaline or neutral, but may be acid; and consisting mainly of a strong solution of chloride of sodium, without any albumen or other organic substance, but said to contain succinate of soda. 4. Floating in this fluid, or attached to the inner surface of the mother-cyst when small, are numerous secondary or "daughter-cysts," in some instances amounting to hundreds or thousands, completely filling the space, so that there is little or no fluid, and becoming flattened by mutual pressure, having precisely the same structure as the mother-sac; within the larger of these there may be a third generation, and rarely a fourth. 5. When the walls of the sacs are examined carefully, little whitish, opaque spots are visible on the inner surface, which are the scolices of the echinococcus in various stages of development, usually in groups or clusters, occasionally single. These may also be free in the fluid, making it somewhat opaque. Each scolex is very minute, measuring from $\frac{1}{30}$th to $\frac{1}{8}$th of a line in length, but this and the form vary according as the head is retracted into the body or extended. The head presents a proboscis, four suckers, with a double circle of characteristic, curved hooks, movable, of unequal length; a constriction separates it from the body, the latter being striated longitudinally and transversely, and presenting behind a depression with a pedicle, by which the animal is fixed to the sac in its early condition. Numerous round and oval calcareous particles are imbedded in the tissue.

In most cases there is but one tumor as above described, but sometimes there are 2, 3, or more, though one predominates over the others generally. The size varies extremely, and the hydatid may attain such dimensions as completely to fill the abdomen and invade the chest. The daughter-cysts usually range from a millet-seed to an egg in size, but subsequent generations are very minute. Originally the shape tends to be spherical. The right lobe is the most frequent seat, but the cyst may be in any part, deep or superficial. Necessarily if the hydatids are numerous, large, or superficial, they alter more or less the dimensions and form of the liver, giving rise to prominences. As regards the effects on the surrounding hepatic tissue, this is often atrophied and compressed; sometimes hypertrophy of the healthy portion occurs. Peritonitis may be excited over the tumor, causing thickening and adhesions.

The events which are liable to happen in the course of hydatid disease are important, and may be summed up as follows: 1. The tumor enlarges, displacing adjoining structures and interfering with their functions, until it bursts in some direction, or is ruptured by violence or in some other way. The opening may take place externally through the abdominal or lower thoracic walls; into the pleura or lung, especially the right, which is the most common direction; pericardium rarely; peritoneum; stomach or intestines; gall-bladder or bile-ducts; hepatic vein or inferior vena cava. 2. Inflammation and suppuration sometimes occur, either spontaneously from rapid growth, from injury or operation, or from the entrance of bile. 3. If the hydatid is slow in its progress, it not uncommonly undergoes degenerative processes as it gets older, and this may ultimately bring about a spontaneous cure. The entrance of bile is supposed sometimes to induce this. The outer capsule becomes much thickened, firm, irregular, opaque, and ultimately calcified partially or completely. This impedes further growth, and the contained hydatids compress each other, shrivel and dry up, and die. The fluid also thickens and becomes opaque, and, in short, fatty and calcareous degeneration take place throughout, until there only remains a putty-like débris, in which shreds of the vesicles and hooklets of the echinococci are imbedded, revealing the nature of the mass. Hæmatoidin crystals are often found in it, and there is usually much cholesterin. A cicatrix-like depression may finally be left. 4. Occasionally cysts are found in which there are no echinococci. The name "acephalocyst" has been applied to this condition, and it has been regarded as an abortive or sterile form of the parasite, in which the development is arrested, or as an earlier stage of its growth.

Allusion may be briefly made here to a very rare form of this disease, named "multilocular hydatid cyst." The liver is found occupied by a mass, in some cases as large as a child's head, or larger, consisting of a stroma of cellular tissue, usually altered considerably by fatty degeneration, in which are imbedded cells or alveoli of various sizes, inclosing a gelatinous substance, in which microscopic examination reveals fragments of the laminated membrane of hydatids, hooklets, or occasionally even perfect scolices, as well as abundant calcareous particles. The centre of this mass is very liable to undergo suppuration, thus altering its characters considerably. This arrangement of the tumor has been attributed to the embryos having been deposited in the lymphatics, bloodvessels, or ducts of the liver; or to the absence or early rupture of the external fibrous cyst, so that the parasites are able to grow and migrate in various directions, and may thus enter the different vessels.

Other organs and tissues are not uncommonly the seat of hydatid tumors at the same time as the liver.

SYMPTOMS.—In general terms the ordinary clinical history of hydatid tumor of the liver may be summed up in the absence of any morbid sensations referable to this organ, or of any interference with its functions, or constitutional disturbance, while it presents a peculiar form of enlargement. It may be latent from first to last. Should it attain a great size, there is often a sense of fulness and tension, and in rare cases jaundice, or signs of portal obstruction arise, in consequence of pressure upon the ducts or veins, or their being blocked up by hydatids. Surrounding structures may also be interfered with, especially the diaphragm and respiratory organs. Should the cyst rupture, the consequent symptoms depend on the direction in which this takes place, being in many instances very grave. If the opening is external, characteristic structures may be discharged. The occurrence of suppuration is indicated by the ordinary local and constitutional signs of hepatic abscess.

The *physical characters* of hydatid tumors demand particular attention. *a.* The liver is increased in size, and this is generally the first thing which attracts notice. The growth is, as a rule, very chronic and imperceptible in its progress, but finally it may attain enormous dimensions, so as to give rise to a general enlargement of the abdomen, or it may invade the whole of the chest, causing it to bulge. *b.* The form of the liver is altered, as evidenced by palpation and percussion, while there is often an evident tumor in some part, especially the epigastrium or hypochondrium. Smaller prominences are sometimes felt along the margins or surface, causing lobulation and irregularity. *c.* Any prominent hydatid tumor is generally quite smooth, and more or less elastic or fluctuating. *d.* "Hydatid fremitus" is often elicited very clearly. *e.* In any doubtful case it is justifiable to make an exploratory puncture with a small trocar and remove some of the fluid, the physical and chemical characters of which are quite characteristic. Perhaps some of the microscopic structures may come away also.

It must be remarked that the signs above described are modified considerably by the degenerative and other changes which occur in the cyst. The outer wall may feel hard and bony. If the case only comes under observation when the abdomen presents a general enlargement, it is by no means easy in many instances, except by the history, to make out where the growth originated.

The *multilocular cyst* is said to be distinguished by being nodulated, hard, and tender; by jaundice, ascites, and enlargement of the spleen being usually present; and by its tendency to inflame and suppurate. This variety may run a very rapid course.

Cancerous and other Growths.

Etiology.—The liver is one of the most frequent seats of internal cancer, which may be either *primary* or *secondary*, the latter especially occurring after cancer of the stomach. It has sometimes been attributed to injury. Most cases are met with between 50 and 70 years of age, the disease being extremely rare before adult life. In some there is an hereditary taint. Dr. Walshe believes it is more common among males, and such has been my own experience.

Anatomical Characters.—Ordinarily hepatic cancer occurs in the form of distinct nodules or tuberous masses, having characters intermediate between those of scirrhus and encephaloid, approaching more to one variety or the other in different instances. There is a wide difference as to size and number, the nodules being small at first, and gradually enlarging, until they may reach the dimensions of a child's head or more. Commonly several are found, unequal in size, and by their coalescence considerable tracts of the organ are sometimes involved. Originally the shape is spherical, but when the masses reach the surface they become flattened, or even depressed in the centre, so as to present shallow concavities or umbilications. As a rule they are not separated from the surrounding tissue by any definite structure, but occasionally there is a distinct cyst around a mass. Generally the consistence is moderately firm, but it may range from that of a soft, brain-like, semi-fluctuating substance to that of a hard, cartilaginous tissue, and the amount of cancer-juice which can be expressed will vary accordingly. The color of a section is in most cases white or yellowish-white, more or less dotted and streaked with red, from vessels, but it may be extremely vascular and dark-red, resembling "fungus hæmatodes." The proportion of cancer-cells and fibrous stroma in any mass, as observed under the microscope, depends on the variety to which it belongs.

The liver is enlarged in proportion to the number and size of the growths, being often extremely large and heavy, as well as irregular. Its tissues are more or less destroyed and compressed, the vessels and ducts are invaded upon or obliterated, and as a result jaundice and signs of obstructed circulation are often present. New vessels form, originating in the hepatic artery. Some observers describe the cancer as beginning in the centre of the lobules, others in the interlobular tissue. When a mass reaches the surface it produces limited peritonitis, with thickening and adhesions. Neighboring tissues may be involved by extension, and the lymphatic glands in the portal fissure are often implicated.

The growth is sometimes extremely rapid, especially when the cancer is soft. Certain changes are liable to occur. The vessels of encephaloid cancer often give way, leading to extravasations of blood into the interior, which afterwards change, and give rise to unusual appearances. Very soft accumulations have burst into the peritoneum in rare instances. Degenerative changes frequently occur in the less rapid forms, in the way of caseation, or atrophy with contraction, induration, and the formation of a firm cicatrix. A section frequently presents a reticulated appearance from fatty degeneration.

In exceptional cases hepatic cancer is infiltrated. Melanosis, cystic cancer, and colloid have been extremely rarely met with. Recent more careful observation has shown that some of the morbid growths, generally described as cancer, are composed of spindle-celled sarcoma; cysts, resulting from obstructed ducts, and erectile tumors have also been described.

SYMPTOMS.—Hepatic cancer is in the great majority of cases characterized by marked local disturbances; but it may be latent.

first, merely a sense of discomfort and weight is experienced; on, however, increasing to distinct pain and tenderness, which equently become very severe, especially if the growth of the cancer is rapid, or if peritonitis is excited. The pain is often lancinating, shooting to the back, shoulders, over the abdomen, &c. Jaundice and ascites are also common symptoms, being usually the result of obstruction of the main ducts and vessels by projections from the liver or glands in the fissure; ascites may be associated with chronic peritonitis. Once the jaundice begins it is persistent as a rule, and often becomes intense, but it may be temporary from catarrh of the ducts. The spleen is but rarely enlarged. The superficial abdominal veins are sometimes distended.

Physical Signs.—The characters of the liver indicative of cancer are: *a.* Enlargement, frequently very great, rapid in its progress, and chiefly in a downward direction. *b.* Alteration in shape and irregularity of outline, nodules or larger masses being felt, or sometimes even seen along the surface and margins, which are not uncommonly *umbilicated*. *c.* As a rule, considerable firmness and resistance of the projections, though they occasionally have a soft elastic feel, or even afford a sense of obscure fluctuation. *d.* Occasionally, friction-fremitus and sound during breathing, these being chiefly due to peritonitis.

Digestive derangements are necessarily present in most cases, and they frequently first attract attention. The cancerous cachexia is usually well-marked, with rapid wasting, debility, and anæmia. There may be pyrexia from time to time, sometimes considerable when the progress of the disease is rapid. Cancer is frequently present in other organs, either primary or secondary, especially in connection with the alimentary canal.

The progress of hepatic cancer is generally very rapid, ar rarely does a case extend beyond a year.

Cirrhosis of the Liver—Chronic Atrophy.

Etiology and Pathology.—Undoubtedly several d morbid conditions have been included under the term "cirr which have totally different modes of origin. With regar genuine disease, it is usually considered as resulting from a *chronic interstitial inflammation,* extending into the minutest portal canals, and leading to proliferation of cellular tissue between the lobules, or as some describe, to an exudation, which organizes and then contracts, with consequent pressure upon and obliteration of the vessels, and atrophy of the secreting elements. Some have attributed it to a *constitutional diathesis* characterized by the formation of a fibroid tissue in different organs and structures of the body, of which the morbid state of the liver is but a local development. While others still have regarded the disease as commencing in *degeneration and destruction of the secreting cells,* the ducts, vessels, and areolar tissue remaining, followed or not by proliferation of the latter. *The important exciting cause* of these changes is *abuse of alcohol,* especially indulgence in ardent spirits on an empty stomach. Hence the common name "gin-drinker's liver." The alcohol being absorbed and circulating through the liver is considered either to set up inflammation or to lead to degeneration of the cells, according to the view held as to the pathology of the disease. Cirrhosis, however, is certainly occasionally met with where there is no history of intemperance, and it has then been attributed to the influence of malaria or prolonged heat, abuse of hot condiments and various articles of diet, the circulation of products of faulty digestion, or to the extension of a localized peritoneal inflammation. It is chiefly met with between 30 and 50 years of age, being rare in youth, and not common in advanced age. Males suffer more than females, and also those who from their occupation or in any other way are more exposed to the exciting cause.

ANATOMICAL CHARACTERS.—In the advanced stage of cirrhosis the morbid appearances are very characteristic. The liver is greatly contracted, wasted, and diminished in weight, sometimes even to ¾ or ½ the original, especially the left lobe and edges, the latter being often reduced to a thin fibrous rim. The form is frequently somewhat rounded. The surface is very pale and covered more or less with roundish prominences, varying in size from minute granules to projections or knobs ¼ or ½ an inch in diameter, or even larger, like hobnails (hence the names "granular or hobnailed liver"). They may be tolerably uniform in size, but are more commonly unequal. Local puckerings or depressions are often observed. The capsule is thickened, opaque, and inseparable, while local peritoneal adhesions and thickenings are almost constant. The consistence is remarkably dense, firm, tough, and leathery, as a rule, which is best realized on making a section. This exhibits the same granular appearance as the surface, sometimes to a much more marked degree. The color is generally a mixture of dirty-white or grayish and yellow; the former being arranged in lines or bands of different widths, sometimes extending over considerable tracts; the latter, which varies in tint, being in some specimens bright-yellow, in others almost brownish, corresponding to the granulations. The name "cirrhosis" is derived from this yellow appearance. In extreme cases, however, but little of it is evident.

The intimate changes in structure and the microscopic appearances must now be considered. The white tissue is generally supposed to be made up mainly either of fully-developed fibrous tissue, or of young connective-tissue elements in process of development, chiefly resulting from proliferation. It has, however, been described as consisting, in some instances, of the remains of vessels, ducts, and other tissues which have not undergone destruction. Generally this material has numerous vessels running through it, which are stated by Frerichs to be derived from the hepatic artery. The yellow nodules correspond to lobules or groups of lobules which have not yet undergone complete disintegration. The color is chiefly due to stasis of bile, owing to pressure upon the minute ducts; it partly results, however, from fatty degeneration of the cells. A large proportion of these have been wholly destroyed. Most of those which remain are greatly altered, appearing shrunken or fatty, or containing pigment-granules. The degeneration begins at the *circumference* of the lobules, and extends towards their interior. The vessels also present important changes. Many of the smaller branches of the portal vein are compressed or obliterated, and its capillaries destroyed, so that injection of them from the main trunk is impossible. This and the larger branches are often dilated, and may be occupied by thrombi. Sometimes a considerable branch is compressed. The hepatic artery is also commonly dilated, and new capillaries form in the fibrous tissue; frequently black pigment is found in its branches. The chief branches of the hepatic vein are not altered, but many of its capillary tributaries are obliterated, and the communications between it and the portal system more or less destroyed. The remaining capillaries are commonly in a state of fatty degeneration.

The degree to which the changes described are observed, necessarily differs considerably according to the stage of the disease. In the earliest condition there can be no doubt but that the liver is enlarged, which is proved rather by clinical observation than post-mortem examination. At this time the granular appearance is absent or but slightly marked, while the entire organ is congested, and is described as being occupied by a succulent, vascular, grayish material, consisting of young connective tissue. In exceptional instances, however, a cirrhosed liver is enlarged throughout, and even to a marked degree. This is generally due to its being associated with fatty or lardaceous disease, but not always.

The effects of cirrhosis outside the liver are highly important, and are visible on post-mortem examination, being mainly those already mentioned as resulting from obstruction of the portal circulation. Most important as regards treatment is the fact that considerable anastomoses form between the hæmorrhoidal veins, and also between the superficial branches of the portal vein in the liver and the veins of the diaphragm and abdominal walls, through the peritoneal adhesions and along the suspensory ligament.

Similar changes to those observed in cirrhosis are not unfrequently met with in other organs and tissues at the same time.

A brief account will now be given of certain other forms of chronic atrophy:

1. As the result of long-continued mechanical congestion from heart disease, the liver contracts and presents characters much resembling those of true cirrhosis, but there is an important difference, and the atrophy is rarely so marked as in the latter. It is produced by the pressure of the distended tributaries of the hepatic vein upon the contiguous cells, causing their degeneration; hence the *centre of the lobules* becomes first wasted and depressed,

while the circumference remains and forms granulations. Ultimately extensive depressions are produced, and more or less proliferation of connective tissue occurs. Attacks of chronic perihepatitis are also common, which increase the tendency to atrophy.

2. Dr. Murchison describes a form of granular atrophy, generally independent of intemperance, in which the fibrous tissue is not increased, and the liver is softer than in health.

3. Atrophy may result from *adhesive pylephlebitis*, by which the trunk or some of the branches of the portal vein are obliterated. Cicatricial retractions are observed on the surface, with corresponding indurations.

4. Another form is that due to chronic or repeated attacks of peri-hepatitis, which induces thickening of the capsule or pressure upon the vessels, while fibrous bands pass into the interior, but there is no granulated appearance.

5. Syphilis not uncomonly leads to atrophy, either by exciting peri-hepatitis or simple interstitial hepatitis, or as the result of changes in gummatous deposits.

6. The last variety is named "red atrophy" by Rokitansky, or "chronic atrophy" by Frerichs. It may be associated with the deposit of pigment in the minute vessels of the liver, especially after prolonged or repeated attacks of malarial fever; or it sometimes follows ulceration in the alimentary canal. The entire organ is wasted, but it differs from true cirrhosis in there being no granulation of the surface; in a section being dark-brown or bluish-red and homogeneous, there being little or no indication of lobules; and in the consistence being less firm. The cells are often diminished in size, and filled with brown pigment-granules. The ramifications of the portal vein are destroyed, its branches ending in cæcal, club-shaped extremities.

SYMPTOMS.—In all these different forms of contracted liver, the diagnostic clinical indications are derived from the evidences of *interference with the portal circulation*, and the signs afforded by *physical examination*. There are, however, in addition, symptoms resulting from *derangement of the secreting functions* of the liver, and others evidencing marked *constitutional disturbance*.

In the early stage of true *cirrhosis* it is customary to describe a train of symptoms which set in insidiously as a rule, but in reality they are merely those of congestion of the liver with gastroenteric catarrh; and though it might be suspected that cirrhosis was being set up, should such symptoms arise associated with abuse of alcohol, there is nothing characteristic about them. Occasionally the disease begins with severe local symptoms, indicating acute hepatic congestion, catarrh of the ducts, and gastroenteritis, accompanied with pyrexia. For a time there are physical evidences of enlargement of the liver. As the case advances the consequences of portal obstruction are observed, viz., ascites, often extreme in amount; enlargement of the superficial veins of the upper part of the abdomen, especially on the right side; gastroenteric catarrh; hemorrhage from the stomach or intestines; hæmorrhoids; and enlargement of the spleen. Digestive disturbances are usually prominent. Although painful sensations about the hepatic region are sometimes present in the early stages, when the disease is advanced there is rarely much uneasiness, if any; there may be tenderness, chiefly due to peritonitis or perihepatitis. Jaundice also is but rarely a prominent symptom, being often quite absent, but more or less of it is observed in many cases from time to time, especially at the early period, mainly due to congestion, catarrh of the ducts, or pressure of enlarged glands. Extreme jaundice occasionally results from peri-hepatitis, or it appears towards the termination of a case, independently of any obstruction. The stools almost always contain bile.

Physical Signs.—Those usually noticed are: *a.* Diminution in area of hepatic dulness in proportion to the contraction. *b.* Granulation or nodulation of the surface, with a feeling of hardness; in short, the characters described under the morbid anatomy. Sometimes the edge of the liver can be grasped between the thumb and fingers. *c.* Occasionally friction-sound. Ascites often obscures the examination, but in such cases the organ can frequently be easily felt after paracentesis. It must be remembered that in some instances there is great enlargement of the liver, but the nodulated surface can then generally be well recognized.

The *constitutional disturbance* is frequently very marked at last, there being considerable emaciation and weakness, with a peculiar, sallow, earthy complexion, a dry harsh skin, and flabby tissues. Purpuric spots and blotches on the skin are sometimes visible, and there may be extensive ecchymoses or hemorrhages from mucous surfaces.

The progress of cirrhosis is generally very chronic, but it may run a tolerably rapid course from the first appearance of distinctive symptoms. The chief modes of death are from gradual asthenia and exhaustion; jaundice with typhoid symptoms; lung complications; acute peritonitis; or hemorrhage from the alimentary canal.

The other forms of contracted liver only differ clinically from that just described in the circumstances under which they arise, and in the physical characters presented by the liver to palpation, if the organ can be felt. In the variety due to peri-hepatitis considerable pain and tenderness are generally complained of from time to time.

TUBERCULOSIS.

Tubercle is generally observed in the liver only in connection with general acute miliary tuberculosis. Occasionally it is secondary to chronic tubercle in other parts. It may break down and form small cavities. Clinically it cannot be recognized with any certainty. The organ is usually enlarged.

SYPHILITIC DISEASE.

The morbid conditions of the liver which may result from syphilis are: 1. Lardaceous disease. 2. Peri-hepatitis. 3. Simple interstitial hepatitis, leading to general atrophy and induration. 4. Gummous hepatitis, in which gummata are deposited more or less extensively, undergoing degenerative changes and becoming surrounded by a dense fibroid tissue, from which processes extend towards the surface in various directions. The liver-tissue becomes destroyed, and deep cicatricial depressions or furrows are seen on the surface, producing a lobulated appearance. During life the characters of the liver may often be determined by physical examination, in the gummatous form being enlarged.

There is often pain, with tenderness, and sometimes signs of obstruction of the bile-ducts and portal vein appear. The progress is usually very chronic.

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CHAPTER XLII.

AFFECTIONS OF THE GALL-BLADDER.

THE morbid conditions to which the gall-bladder is subject can only be briefly indicated. Most of them cause enlargement, and it is important to be able to recognize the distinctive clinical characters of each form of enlargement.

1. *Distension with Bile.*—When anything obstructs the common bile-duct, *e. g.*, a gallstone, the gall-bladder becomes filled with bile and may attain enormous dimensions. There will be the usual signs of *obstructive jaundice*, with enlargement of the liver; while the gall-bladder is perceptible as a *fluctuating tumor*, sometimes reaching nearly to the iliac crest, and generally somewhat tender.

2. *Acute Inflammation and Suppuration.*—The mucous membrane of the gall-bladder is liable to simple catarrh, croupous or diphtheritic inflammation, like other mucous surfaces; but the important form of acute inflammation is that which is attended with the formation of pus in its interior, which particularly results from irritation of gallstones, or from obstruction of the *cystic* duct by these. It is clinically indicated by a very painful and tender fluctuating enlargement of the gall-bladder, which may ultimately assume the characters of an abscess, or even burst, accompanied with marked rigors and pyrexia, the latter tending to become of a hectic type. It is often preceded by signs of gallstones, but there is no jaundice or hepatic enlargement, as a rule.

3. *Chronic Inflammation. Hydrops Vesicæ Felleæ. Dropsy of the Gall-Bladder.*—If the cystic duct is obstructed for a long period, the gall-bladder may become gradually dilated by the accumulation of a clear, serous, or synovial-like fluid, the product

of unhealthy secretion by the mucous surface, probably partly the result of chronic catarrh, while the walls become much thinned and atrophied. The organ is more or less distended, often to an extreme degree, but there is little or no pain or fever, while jaundice is absent and the liver is not enlarged. Occasionally the result is different. The liquid portions of the contents of the gall-bladder are absorbed, an inspissated substance remains, in which calcareous salts are deposited; the walls undergo thickening and contraction from chronic inflammation, and ultimately a firm, puckered mass is left, inclosing a chalky pulp.

4. *Accumulation of Gallstones.*—Gallstones are often present in the gall-bladder, without affording any evidence of their existence. In some instances, however, especially when they are very numerous and large, they cause local uneasy or painful sensations, increased after food or after much exertion or jolting; as well as reflex disturbance of the stomach and other parts, and sometimes much constitutional discomfort and depression. Occasionally also they give rise to temporary severe symptoms by attempting to enter the cystic duct and then falling back into the gall-bladder. They may also excite inflammation or ulceration of the mucous surface, the latter ending sometimes in perforation or giving rise to pyæmia. In rare instances such a number of calculi collect as to form a *tumor*, even of considerable size, having the general characters of enlargement of the gall-bladder as regards position, shape, and mobility, with the following differences: *a.* It feels hard and sometimes nodulated. *b.* On palpation a peculiar sensation is experienced, owing to the rubbing together of the calculi, compared to that produced by grasping nuts or pebbles. *c.* A corresponding sound may be heard on auscultation, and occasionally loud rattling is perceptible on shaking or moving the patient. Now and then local peritonitis is excited by this enlargement, so that it becomes adherent and fixed. When such a tumor exists there are necessarily more marked subjective sensations, such as weight and uneasiness, especially on moving from side to side. The course of these cases and the growth of the enlargement are very slow.

5. *Cancer.*—The signs of this rare disease are: *a.* Lancinating pains with much tenderness in the region of the gall-bladder.

b. A tumor, having more or less of the characters of enlarged gall-bladder, but usually feeling firm, resistant, irregular, and nodulated, without the peculiar sensation of gallstones; being adherent and fixed; and growing rapidly. There are always evidences of cancer in other parts, with well-marked cancerous cachexia. A fistulous communication with the intestines is often formed. Gallstones are usually present. Jaundice and vomiting are common symptoms.

CHAPTER XLIII.

GALLSTONES—BILIARY CALCULI—CHOLELITHIASIS.

Etiology and Pathology.—There is considerable uncertainty as to the mode of origin of gallstones. The chief views may be thus stated: 1. That they are merely the result of inspissation and concentration of bile. 2. That they depend upon certain biliary ingredients being in excess, especially cholesterin and coloring matters. 3. That the bile has some abnormal composition, either when first formed, or as the consequence of subsequent chemical changes, which prevents it from holding certain elements in solution, and hence they are deposited. Thus calculi have been attributed to deficiency of soda, with excessive acidity; excess of lime, causing a separation of pigment; decomposition of the salts of soda with the biliary acids, or decomposition of the latter, with consequent precipitation of cholesterin and pigment. 4. That they originate in plugs of mucus, epithelium, or foreign bodies (worms, fruit-stones, &c.), upon which the ingredients of the bile are afterwards deposited.. It is highly probable that each of these views is correct in different cases, and when once the formation of a gallstone has commenced, its increase may be due to some other cause than that which originated it. There can be no doubt but that a catarrhal state of the gall-bladder and ducts favors the production of calculi, either by inducing stagnation, or, as some believe, by the mucus then formed favoring decomposition of bile, or adding carbonate of lime to it. This decomposition has also been attributed by Dr. Thudicum to the absorption of some ferment from the intestines.

There are some important *predisposing causes* of gallstones, viz., advanced age; the female sex; sedentary habits; habitual constipation; overindulgence in animal food and stimulants; and organic diseases of the liver, gall-bladder, or ducts, interfering with the escape of bile. They have also been attributed to drinking water containing excess of lime.

ANATOMICAL CHARACTERS.—By far the most frequent original seat of biliary calculi is the gall-bladder, but they may be found in any portion of the ducts, or even in the liver itself. The number varies from one to hundreds or thousands; usually several are found. There is also a wide range as to size, this being in an inverse ratio to the number; several are sometimes cemented together, so as to form a large concretion. Originally most of the calculi are round or oval, but when numerous, by rubbing together they become worn and angular, presenting flat or concave facets, or occasionally actual articulations. When formed in the ducts they exhibit curious shapes, being branched, coral-like, &c. As a rule gallstones have a brownish or greenish-yellow color and are opaque, but they present an endless variety of tints, from white to black, blue, green, red, &c., according to their composition; occasionally they are somewhat translucent. They frequently have a greasy or saponaceous feel, with a waxy, brittle consistence, being readily cut or crushed; sometimes they are very firm. Most of them sink in water when recent, but some float, and most will after having been dried. The structure is rarely homogeneous and uniform. In the majority of cases, after a calculus has existed some time, a section reveals distinctly three parts, named from within out,—the *nucleus*, of which there may be more than one; the *body*, which is often in concentric layers, or presents a radiated appearance; and the *cortex* or *crust*, this being usually smooth externally, but occasionally wrinkled, rough, or tuberculated and warty. As a rule the layers become lighter in color from the centre towards the circumference, but not always. Sometimes a fracture presents a crystalline aspect. The *chemical composition* is very variable, but the most common ingredients are cholesterin and bile-pigments, with a little lime or magnesia. To these may be added biliary and fatty acids, generally combined with lime; modified bile-pigments; phosphates, carbonates, salts of soda or potash in small proportions, and metals (iron, copper, and manganese). The nucleus is often made up of mucus and epithelium, and the former may unite the different parts. The appearances differ according to the composition, which is not necessarily uniform even in the same layer. It is quite impossible to describe the characters corresponding to the various ingredients, but it may be stated generally that in proportion to the amount of cholesterin a calculus contains, is it whiter, more transparent, crystalline or radiated and lamellar, and of lighter specific gravity.

Biliary sand or gravel is not uncommonly met with, consisting either of cholesterin, bile-pigment, or black pigmentary matter.

The morbid conditions which are liable to be produced by gallstones may be stated as follows: 1. Irritation, inflammation, suppuration, ulceration, with consequent pyæmia or perforation, of the gall-bladder or ducts, the last taking place in different directions, especially into the stomach, duodenum, peritoneum, or externally through the abdominal wall, and rarely into the colon, portal vein, pleura, pelvis of the right kidney, or vagina. Permanent fistulæ may be left. 2. Inflammation and abscesses in the liver, if lodged there; or formation of a cyst around the calculi. 3. Obstruction of some of the ducts in the liver, or of the hepatic, cystic, or common duct, with the usual consequences. 4. Obstruction of the intestines by a large calculus, this having probably entered through a fistulous communication from the gall-bladder. 5. Inflammation, ulceration, or gangrene of the bowel, with consequent perforation.

Symptoms.—It is only needful here to describe those symptoms which indicate the *passage of a gallstone* along the duct to the intestine—*biliary* or *hepatic colic*—these being usually severe, but not always. The attack begins with a sudden, intense pain in the right hypochondrium, in some cases most excruciating, often coming on just after a meal or after effort; it is described as constricting, griping, tearing, burning, boring, &c., and it shoots over the abdomen, round the side, to the back, or towards the right shoulder. The patient is doubled up and rolls about, just like in ordinary colic, groaning or screaming, and pressing upon the abdomen, which gives some relief, there being generally no tenderness at first. The pain may subside, leaving a dull aching, but urgent paroxysms come on again at intervals. The attacks are accompanied with much exhaustion, signs of collapse, a disturbed and anxious expression of countenance, faintness which may end in actual syncope, and cramps of the abdominal muscles, but no pyrexia. Sympathetic vomiting is frequently present, and sometimes hiccup. Among occasional symptoms are spasmodic tremors or actual convulsions, and marked rigors. In the course of a day or two, should the gallstone reach the common duct, there are as a rule the usual signs of *obstructive jaundice*, which may become intense, its duration depending upon that of the obstruction. When the calculus reaches the duodenum the suffering generally subsides suddenly, with a feeling of intense relief, and then the jaundice gradually disappears. In the great majority of cases calculi pass on by the bowels and are discharged in the fæces, sometimes in great numbers, without producing any further mischief, and they may be detected by *washing the stools through a sieve or through muslin.* Very rarely they pass into the stomach and are vomited.

There are a few points of practical import which require notice. The intensity of the pain is by no means necessarily in proportion to the size of a gallstone, but rather to its angular shape. It usually diminishes when the concretion reaches the common duct, because this is larger than the cystic duct, but it increases again as the orifice is approached. Jaundice is not a necessary accompaniment, or it may be but slight, because when the calculus is angular it leaves room for the bile to flow by, or its passage is sometimes too rapid for the appearance of jaundice; on the other hand this may become permanent and extreme, owing to the permanent impaction of a stone. It is very important to look for the calculi in the stools, as by their shape, number, &c., an opinion can often be arrived at as to whether any remain behind, with their characters. When one large gallstone has escaped other smaller ones often follow without causing any particular disturbance. Sometimes the pain subsides, but no calculus is passed, because it returns to the gall-bladder. Sometimes pain and soreness remain after the escape of a concretion into the duodenum, owing to nervous irritability or to local irritation of the nerves, and inflammation may be excited, indicated by pain and tenderness with fever. The symptoms of hepatic colic are occasionally merely due to the passage of grit or inspissated bile. An attack may end fatally, from the mere intensity of the pain and collapse, quite irrespective of the serious morbid changes a gallstone is liable to set up, any one of which may cause death.

CHAPTER XLIV.

GENERAL DIAGNOSIS OF CHRONIC LIVER AFFECTIONS.

THE main elements in the diagnosis of chronic hepatic diseases, both from other affections and from each other, are as follows: 1. The *general history* of the patient may reveal some known cause of certain liver complaints, especially abuse of alcohol; overeating, with deficient exercise, and general luxurious habits; prolonged residence in tropical climates or malarial districts; the previous occurrence of dysentery or ague; or syphilitic infection. Family history may afford some aid in diagnosis, especially if indicating a cancerous taint, and in some cases the age and sex of the patient deserve consideration. 2. The *constitutional condition* is highly important. Thus there may be some state in which lardaceous or fatty liver is likely to be met with; or signs of the cancerous cachexia, syphilis, or cirrhosis. On the other hand, the absence of any constitutional disturbance is sometimes serviceable in diagnosis. 3. The presence or absence of *symptoms referable to the liver*, as well as their nature, intensity, and the history of their progress, also deserve careful attention, especially as regards pain and tenderness; jaundice; ascites and other evidences of portal obstruction. 4. *Physical examination* is of course highly valuable. This will be presently more fully alluded to. 5. The *state of other organs* may afford much aid, especially by revealing local manifestation of some constitutional disease, *e. g.*, cancer in the stomach, waxy kidney; or of some condition with which hepatic derangement is likely to be associated, especially any ulceration in the alimentary canal, gastro-enteric catarrh, or a state of the heart which obstructs the circulation. 6. The rapidity of the progress of a case up to the time it is first seen, as well as its subsequent course, with the results of treatment, are to be considered in difficult cases.

Physical examination demands special attention, particularly in detecting and making out the characters of *enlargements* or *contractions of the liver*, and *enlargements of the gall-bladder*. 1. *Enlargements*. For differential diagnosis the following points must be noted, and in the description of each individual disease, an endeavor has been made to arrange the characters in the same order: *a*. The extent, direction, and rapidity of growth. *b*. Whether the liver is normal in shape and outline, or presents outgrowths or irregularities. *c*. The condition of the surface and margins as to smoothness, nodulation, &c. *d*. The consistence and other sensations afforded by the liver generally, as well as by any special prominences, including fluctuation, hydatid fremitus, &c. *e*. Whether there is any evidence of local peritonitis in the way of friction-fremitus or sound, or adhesions to the abdominal wall. *f*. Now and then it is requisite to use the *exploratory trocar*. The characters to be observed in connection with contractions of the liver and abnormal conditions of the gall-bladder, have been sufficiently indicated in their general description. It is only necessary to add with regard to the gall-bladder, that it should always be noticed whether this is altered alone or along with the liver, and *vice versâ*.

It may be useful to enumerate the causes of enlarged liver. The ordinary forms are due to—1. Congestion, especially mechanical. 2. Accumulation of bile from any obstruction in the ducts. 3. Albuminoid disease. 4. Fatty infiltration. 5. Hydatid cysts. 6. Cancerous and other growths. 7. Hepatitis, especially when ending in suppuration. 8. Cirrhosis *in its early stage*, and in very exceptional instances, even when advanced. As very rare causes may be mentioned—9. Simple hypertrophy. 10. Syphilitic gummous hepatitis. 11. Tubercle. 12. Lymphatic growths. 13. A peculiar enlargement associated with vitiligoidea.

The chief practical difficulties in making out a diagnosis which have come under my notice are as follows: 1. Hepatic enlargement, and sometimes even changes in shape and other characters, may be simulated by the normally large size of the organ in children; congenital malformation; pressure by a rickety or otherwise deformed thorax, or as the result of tight-lacing; depression by various morbid conditions in the chest, especially pleuritic effusion and tumors; elevation towards the chest by abnormal conditions in the abdomen. On the other hand they may be obscured by distension of the colon with gas, which may even give rise to signs simulating atrophy. 2. Morbid states of other structures often give rise to signs of hepatic derangement; or, on the contrary, they may put these in the background. Thus, enlargement of the liver may be simulated by a rigid and contracted state of the right rectus muscle; inflammation and suppuration in the abdominal walls; accumulation of fæces in the colon; tumor in connection with the right kidney, suprarenal capsule, or peritoneum. Again, a neighboring disease, particularly *scirrhus of the head of the pancreas*, often interferes with the escape of bile from the liver, and thus causes its enlargement, with jaundice. The coexistence of ascites or chronic peritonitis with effusion, frequently renders physical examination unsatisfactory. *The use of the trocar* is then most serviceable, in order to remove the fluid; and also the plan of making *sudden pressure* over the liver. Not uncommonly liver disease is obscured by symptoms referable to a morbid state of some other organ, *e. g.*, cancer of the stomach; and it often itself gives rise to serious disturbance of the alimentary canal. Occasionally the liver is enlarged along with other organs and structures in the abdomen, particularly in cases of cancer, and then it is frequently impossible to make out distinctly what parts are involved. 3. Sometimes the liver becomes so enormous, especially in hydatid disease, as to fill the abdomen, and hence it becomes impossible to tell exactly where the enlargement commenced. In such cases the history of this, as to where it started from, and perhaps its greater prominence about the hepatic region may clear up the difficulty. 4. In some instances the liver is affected with two or more morbid conditions, the signs being modified accordingly, *e. g.*, cirrhosis with fatty or albuminoid disease. With regard to individual diseases, it may be mentioned that *hydatid tumor* is liable to be confounded with distended gall-bladder; soft cancer; right pleuritic effusion; abscess which has become somewhat chronic; aneurism; cystic disease of the kidney; or hydatids outside the liver. *Cancer* may be simulated by syphilitic disease; waxy liver, especially if combined with cirrhosis, or if some parts of the liver are more affected than others, so as to give rise to local projections; other forms of cirrhosis attended with enlargement; multilocular hydatid disease.

It is requisite to make a few remarks relative to *pain* referred to the hepatic organs. This may be simulated by painful affections of the superficial structures, either muscular or neuralgic; gastric and duodenal disorders, either functional or organic; intestinal colic; accumulation of fæces in the colon; aneurismal, pancreatic, and other tumors pressing on the nerves; passage of a renal calculus; pleurisy; the pain met with in hypochondriasis; local peritonitis. The attacks due to the passage of a gallstone are, as a rule, clearly indicated by the individuals in whom they occur, the past history, and the symptoms present, especially when followed by jaundice and the escape of calculi in the stools. It must be borne in mind that gallstones are not uncommonly formed in connection with organic disease of the liver or gall-bladder. Simple hepatalgia is difficult to make out positively. Its characters have already been pointed out.

GENERAL PROGNOSIS.

The prognosis in the case of a chronic hepatic disease depends mainly upon its nature; the degree to which the functions of the liver are interfered with, the escape of its secretion prevented, and its circulation impeded; the constitutional condition; the state of other organs; and upon the possibility of removing any causes which may be producing the disease; with the results of treatment. *Fatty* and *lardaceous* disease are very slow in their progress, and in many cases do not seem to hasten a fatal issue materially, though they are but little amenable to treatment. *Cancer* is necessarily fatal, and is frequently very rapid in its course, especially when of the softer kind. *Hydatid disease* is markedly chronic, and usually unattended with danger, while it may be cured in many cases by appropriate treatment. It occasionally proves dangerous by rupturing, becoming inflamed and suppurating, or by some of its contents being discharged into the bile-ducts, blocking them up. *Syphilitic liver* can frequently be much improved by early and proper treatment. The different forms of *atrophy* are generally serious as regards their ultimate prognosis, though usually slow in their progress. I desire, however, again to draw attention to the fact, that in cases of cirrhosis, if the ascites can be permanently got rid of, a result which may not uncommonly be attained, the patient may be restored to comparatively good health and live many years, engaging in the ordinary avocations of daily life, even in cases which appear to be almost hopeless. It must be remembered that serious and sometimes rapidly fatal hemorrhage from the alimentary canal is liable to occur in cirrhosis. From the account given of gallstones, it will be evident that there are many dangers attending them. Examination of any calculi passed, as to size, number, and shape, will aid in determining whether any remain, and whether the attacks of hepatic colic are likely to recur.

General Treatment.

The management of cases of hepatic disease is to be conducted according to very simple principles.

1. The *diet* needs careful supervision. It often has to be adapted to the constitutional condition, and therefore of a nutritious character, containing abundant protein elements; but it should always be as simple and easily digestible as possible, and particular caution is requisite in the use of alcohol, hot condiments, fatty, amylaceous, and saccharine substances, and rich articles of diet generally. In many cases it is highly important to forbid all stimulants, or only to allow light wines, and if spirits are ever needed, they should be given much diluted and in restricted quantities. Any one who is accustomed to indulge in excess of alcohol, and particularly in taking ardent spirits, must be impressed with the absolute necessity of relinquishing such habits. It is desirable to recommend the patient to take much salt with food.

2. *Hygienic management* is of much consequence in some cases. In addition to the ordinary measures for improving the general health, the points which claim special notice are removal from a tropical climate or malarial district; cessation of sedentary and luxurious habits generally, a sufficient amount of exercise in the

open air being taken daily; and the maintenance of free excretion of the skin by the aid of baths.

3. Treatment directed against some *constitutional morbid condition* often proves highly serviceable, and may have a direct effect upon the liver, which applies particularly to fatty, lardaceous, and syphilitic disease. General tonic treatment and remedies for improving the blood are beneficial in many cases, such as the various preparations of iron, strychnine or nux vomica, mineral acids with bitters. Tincture of iodine well diluted, iodide of potassium or iron, muriate or carbonate of ammonia, have been found by different observers to influence the size of lardaceous liver. Of course mercury and iodide of potassium are the remedies for syphilitic disease.

4. The chief medicines which are believed to act *immediately on the liver*, influencing its secretory functions, and hence named *cholagogues*, are mercury, particularly in the form of blue-pill, calomel, and gray powder; podophyllin; nitric and muriatic acids, either externally or in the form of bath; and taraxacum. Numerous experiments have been made with regard to the effects of mercury and podophyllin, and the conclusion arrived at appears to have been, that they rather diminish than increase the amount of bile in health. Still clinical observation affords evidence that in certain morbid conditions, when the bile is deficient, these remedies do decidedly increase it. This is probably due to their aiding in removing some state which impedes the formation of bile, or in promoting its discharge. Dr. Murchison remarks respecting mercury, that it probably irritates the upper part of the small intestines, so that the bile is propelled onwards instead of being reabsorbed. The best plan of administering this drug to an adult is to give occasionally a tolerably full dose of calomel or blue-pill, either alone or combined with rhubarb, colocynth pill, and extract of henbane. For children gray powder is best. It is certainly injurious to get into the habit of constantly taking these medicines. A dose of podophyllin now and then is also frequently very serviceable. A mixture containing nitro-muriatic acid with extract of taraxacum enjoys considerable repute, especially in congestion of the liver and the earlier stages of cirrhosis, but probably these medicines act mainly through their direct

action upon the alimentary mucous membrane. Sir Ranald Martin recommends the nitro-muriatic acid bath (℥i of strong nitric and ℥ij of hydrochloric to a gallon of water at 90° to 98° F.), in which the feet are placed, and then the inside of the upper and lower extremities and the abdomen are sponged over freely. This bath seems to be of much benefit to those who come from tropical climates, suffering from disordered liver.

5. Symptoms referable to the alimentary canal commonly call for treatment in connection with liver diseases, viz., those due to gastric or enteric catarrh, constipation, flatulence, hemorrhage, &c.; or there may be organic disease at the same time in the stomach or intestines, such as cancer. These conditions must be treated by the usual remedies, especially by alkalies and their carbonates, citrates, tartrates, and other vegetable salts; different bitter infusions or tinctures; saline aperients; and saline mineral waters, either English or continental. It is very desirable to keep the bowels as regular as possible, though not by employing strong purgatives. If there are hæmorrhoids, confection of senna or sulphur is valuable.

6. The two prominent symptoms so frequently calling for treatment in liver affections, viz., *jaundice* and *ascites*, have already been fully considered. I cannot, however, refrain from remarking again here upon the importance of having recourse to the *early and repeated removal of fluid by paracentesis in ascites from cirrhosis, as a means of cure*, a treatment which has of late received additional support from a paper read and discussed in Dublin, and from other communications in the medical periodicals.

7. *Local applications* are frequently of aid, especially to relieve pain and congestion. They include chiefly dry heat, poultices and fomentations, to which anodynes may be added, sinapisms, anodyne plasters, dry cupping, or the removal of a little blood by leeches or cupping.

8. It is desirable to look to other organs, and treat them, if required, particularly the heart, a diseased condition of which may be the immediate cause of hepatic symptoms. The kidneys must also be attended to.

The treatment of *hydatid tumor* requires separate consideration. For the cure of this complaint operative interference is needed, no known drug having any influence upon the parasite, and a spontaneous cure being extremely rare. It is only, however, when the growth attains some size and becomes a source of trouble, that this course of treatment should be adopted, though it should not be delayed too long. There is much difference of opinion as to the most efficient plan of operation. The principal methods advocated are: 1. Puncture with a trocar and canula, and evacuation of the fluid through the latter. 2. Puncture and subsequent injection of the cyst with some irritating liquid, so as to excite inflammation, such as bile or tincture of iodine. 3. Removal of the contents through a large incision. 4. Gradual opening of the cyst by the repeated application of caustic potash to the abdomen over the most prominent part of the tumor. This has been done with the view of causing adhesions and thus preventing the escape of fluid into the peritoneum, and it has also been had recourse to with the same object previous to puncture with the trocar. 5. Puncture of the tumor with needles and transmission of electric shocks through it. Some authorities assert that all that is necessary is to evacuate the fluid, and that then the parasite will die. Others consider that it is necessary to excite inflammation. The balance of evidence seems to be certainly in favor of the simple use of the trocar. Some recommend the employment of a very *small* one, others of a *large* one; again, there is a difference of opinion as to whether it is requisite to remove the whole of the fluid or not, some even using an exhausting syringe to draw it off. Dr. Murchison advocates the employment of a very fine trocar, and advises that the canula should be removed before the whole of the fluid has been drawn off, or as soon as it ceases to flow in a full stream, first passing a wire through the tube to see that it is not stopped up by a hydatid vesicle. The object of this is to prevent the entrance of air, which is one of the main dangers, as it tends to set up suppuration. Another danger is the escape of fluid into the peritoneum, and to prevent this pressure should be made over the punctured portion of the abdomen during the removal of the canula. The opening should be made over the most prominent part of the tumor. Chloroform is not advisable, but local anæsthesia may be induced. After the operation the opening is to be closed with lint steeped in collodion, a compress and bandage being applied over this. Absolute rest is necessary for two or three days, and an opiate should be given at once and repeated if necessary. The fluid may collect again, and it may be requisite to repeat the operation. Dr. Murchison, however, cautions against doing this too soon, as the enlargement may be due to inflammatory effusion. In cases which are ultimately successful a considerable degree of fulness may remain for some months. Should the tumor be very large its walls are likely to be thicker and less elastic, and then it appears best to use a large trocar. A free incision is only admissible when suppuration has taken place, or a large trocar may be then used and an elastic tube left in, the cyst being washed out with carbolic acid solution. The different events which may happen in connection with hydatid tumor must be treated on ordinary principles. In those countries where hydatid disease is prevalent prophylactic measures are necessary, viz., to prevent dogs from feeding on the offal of sheep, exclude them from slaughter-houses, give them meat thoroughly boiled, destroy their excræta which contain tapeworms, and to physic them periodically.—(Murchison.)

The treatment of *gallstones* also calls for a few remarks. *During the passage of a gallstone* the chief measures to be employed are—*a*. To administer narcotics and anodynes, especially opium or morphia in full doses, subcutaneous injection of the latter being very valuable; belladonna; hyoscyamus; chloroform and ether, either internally or by inhalation. *b*. To treat certain symptoms, especially vomiting and collapse. *c*. To apply dry heat, fomentations, poultices, or anodyne applications constantly over the hepatic region, or to put the patient in a warm bath. Antimony and other emetics, which were formerly much employed, as well as strong purgatives, ought to be avoided, in my opinion. Much good is done in some cases by the treatment introduced by Dr. Prout, of drinking a considerable quantity of a warm solution of bicarbonate of soda (ʒi or ʒij to Oj). Large warm enemata may also be beneficial. The application of a few leeches over the hepatic region seems to be useful in prolonged cases, especially if there is much tenderness. For the prevention of gallstones attention to diet and hygiene is most essential, and the use of remedies which improve the state of the alimentary canal, or those which act on the liver, is also often very serviceable. It has been supposed that they can be dissolved after their formation, by means of a mixture of turpentine and ether, chloroform, alkalies, or alkaline mineral waters. It is very doubtful whether either of these has any such effect, but alkalies and mineral waters often do a great deal of good in these cases. The various consequences which may result from gallstones must be treated as they arise. Inflammation about the gall-bladder, from any cause, requires poultices and fomentations. If pus forms, or if in chronic cases much fluid collects, it is sometimes requisite to puncture the cyst and let it out, leaving an external fistula.

CHAPTER XLV.

DISEASES OF THE SPLEEN.

Clinical Characters.—1. The spleen is often diseased without there being any local *morbid sensations.* When it becomes much enlarged, it causes a sense of fulness and tension, chiefly about the left hypochondrium. Occasionally more or less pain and tenderness are complained of. 2. A most important indication of splenic disease is derived from the *constitutional condition.* In prolonged cases a state known as "splenic cachexia" is induced. This is characterized by extreme anæmia, the mucous membranes being pale and bloodless, and the face presenting a waxy, or sometimes an earthy, sallow appearance; great debility; wasting, but not usually rapid; sense of prostration and dulness; shortness of breath on any exertion, with hurried breathing, chiefly due to the anæmia; tendency to hemorrhages, especially in the form of epistaxis, bleeding from the gums, and petechiæ under the skin; œdema of the legs and eyelids, or even general dropsy. 3. Symptoms may arise from pressure of an enlarged spleen on surrounding parts, especially on the diaphragm, the dyspnœa being thus increased, and bronchial catarrh induced. Vomiting may also be excited by pressure on the stomach.

The chief aid in the diagnosis of morbid conditions of the spleen is derived from *physical examination.* The characters of a *splenic tumor* are as follows: 1. It is extra-pelvic, and occupies mainly the left hypochondrium, being felt to come from beneath the margin of the thorax. In its growth it tends towards the front of the abdomen, as well as downwards

wards and to the right, so that ultimately it extends to other regions, and appears superficial, while it can generally be separated posteriorly from the mass of the dorsal muscles. Percussion often shows increase in area of splenic dulness upwards towards the thorax, or backwards, but it rarely reaches above the fifth rib, and does not extend to the spine. There is also an undue sense of resistance, with deficient elasticity of the ribs. 2. The form is usually very characteristic, being more or less that of the spleen exaggerated. The anterior border can be felt directed obliquely down and to the right, sharp and thin, often presenting one or more notches or shallow excavations. The lower end is rounded. The outline of the spleen may occasionally actually be visible. 3. As a rule the tumor feels firm and solid; now and then it gives a sensation of elasticity, but fluctuation is extremely rare. The surface is almost always smooth, but may be irregular. 4. Another important character of splenic tumor is its *great mobility*. Generally it can be readily moved in all directions by *manipulation*, and it is more influenced by the *act of respiration* than any other tumor, being often felt below the ribs after a deep inspiration, when previously imperceptible. *Posture* also affects it markedly. 5. Occasionally a *splenic murmur* is heard.

Some of the difficulties in recognizing enlargement of the spleen require notice. 1. It is often not sufficiently large to come below the margin of the thorax, and can then only be made out by percussion. 2. Even when of some size, it may be kept up by the costo-colic fold of peritoneum, or by adhesions at its upper end. 3. Adhesions may also prevent any mobility and cause the tumor to become fixed. 4. The enlargement is sometimes so great as to obscure altogether the outline of the spleen and the characters of the margin, the latter then assuming a vertical direction. 5. Enlargement of other organs is liable to conceal splenic tumors. 6. Accumulation of flatus in the colon may interfere with its detection. The principal morbid conditions for which enlarged spleen is likely to be mistaken, or *vice versâ*, are cancer about the cardiac end of the stomach; enlarged left lobe of the liver; tumor of the omentum; and tumor in connection with the left kidney or suprarenal capsule.

CONGESTION OR HYPERÆMIA OF THE SPLEEN.

ETIOLOGY.—The spleen becomes readily congested on account of its great vascularity and the yielding nature of its capsule. After every meal it is more or less in this condition. *Active* hyperæmia is commonly observed in acute febrile diseases, especially in typhoid and intermittent fevers, but also in typhus, erysipelas, pyæmia, puerperal fever, acute tuberculosis, &c. It is said to be occasionally vicarious of menstruation. Injury or morbid deposits may cause it. *Mechanical* congestion follows any obstruction to the portal circulation, either direct or secondary to chronic heart and lung-affections.

ANATOMICAL CHARACTERS.—The morbid characters of a recently congested spleen are enlargement, often considerable, the capsule being stretched and smooth; increase in weight; intense redness of a dark hue; and diminution in consistence, the substance of the organ in some instances being quite pulpy or almost liquid. The amount of blood is much increased, red blood-cells are extremely abundant, and the splenic tissue appears increased in some cases. After long-continued or repeated hyperæmia, the spleen becomes permanently enlarged, hardened, and hypertrophied.

SYMPTOMS.—The only clinical sign of congested spleen usually observed is, that the organ is enlarged, but not as a rule to any great degree, and it is liable to vary considerably. Occasionally it feels soft, but is generally tolerably firm. There is no spontaneous pain in most cases, but tenderness is common, and may be very marked in acute congestion. Temporary anæmia has been stated to be associated with great congestion.

HEMORRHAGIC INFARCTION—SPLENITIS.

ETIOLOGY AND PATHOLOGY.—The spleen is one of the organs in which emboli most frequently lodge, giving rise to hemorrhagic infarctions. Some are of opinion that these may also arise from the formation of local thrombi in the organ. Occasionally considerable inflammatory action is excited, especially when the emboli have septic properties, as in typhus or pyæmia, and this is the most frequent cause of splenitis. In rare cases inflammation results from injury; and it has also been stated to occur in malarial districts, especially in certain tropical climates, or idiopathically.

ANATOMICAL CHARACTERS.—Infarctions in the spleen are usually seen on a section in the form of wedge-shaped masses, with the base towards the surface, often projecting somewhat; when situated deeper in the organ they are more or less rounded. They vary considerably in number and size. Originally each infarction is dark and firm, and surrounded by congestion; in time, however, the ordinary changes take place, the coloring matter becoming absorbed, until the mass is of a yellowish-white color. Frequently caseous degeneration with ultimate absorption takes place, a depressed cicatrix remaining; or it may end in calcification. In pyæmia and similar affections, the infarctions rapidly break down, form a purulent fluid, at the same time the spleen being more or less inflamed and congested throughout. Idiopathic inflammation at first cannot be distinguished from mere congestion, the spleen being enlarged, very dark, and softened. One or more abscesses may form, which sometimes finally involve the entire organ, this being converted into a mere bag of pus. An abscess occasionally bursts externally, or into the peritoneum, stomach, thorax, &c. Rarely it becomes encapsuled, and undergoes curative changes, its fluid portion being absorbed, so that finally only a caseous mass remains, which may calcify. The peritoneum is often inflamed over the affected part.

SYMPTOMS.—Very rarely can embolism in the spleen and its results be recognized during life, but it may be suspected if, along with some source of embolism, there should be rigors and pyrexia, with local signs indicating inflammation of the spleen, viz., pain and tenderness in the left hypochondrium; enlargement of the organ; and often vomiting. An abscess is scarcely ever diagnosed; it may possibly give rise to a fluctuating enlargement, or even burst externally. It is attended with hectic fever and rapid wasting. Should it rupture internally, there are the usual signs of perforation.

HYPERTROPHY.—LEUCOCYTHÆMIA.

ETIOLOGY AND PATHOLOGY.—By far the most important form of enlarged spleen is that which is due to *hypertrophy* of its tissue. This may follow any long-continued or repeated congestion, but is particularly observed after ague, or even after mere residence in malarial districts, and as the result of portal obstruction. In this case the hypertrophy seems to be chiefly due to interference with the escape of the cells out of the spleen, and not to excessive formation. It is most important, however, in connection with the disease named *leucocythæmia* or *leukæmia*, which is characterized by the presence of a great excess of white corpuscles in the blood, and an increase in the lymphatic tissues in certain organs and structures, especially in the spleen and lymphatic glands, but also occasionally in the liver, kidneys, lungs, heart, thyroid gland, suprarenal capsules, in connection with serous and mucous membranes. Virchow has described two chief forms of the affection, in one of which the spleen is alone enlarged, this being much the more common; in the other only the lymphatic glands. In some instances both are implicated. The increase in the white blood-cells is no doubt mainly due to *excessive formation* in the spleen or lymphatic glands, but it has also been attributed partly to diminished metamorphosis of these into red corpuscles, to their proliferation in the blood, and to a new formation by the walls of the vessels. Nothing satisfactory is known about the remote causes of this disease.

Anatomical Characters.—In hypertrophy from hyperæmia, the spleen is increased in size and weight, sometimes to a great degree, but retains its normal form; its consistence is increased, and a section appears pale and dry, sometimes gray, or presenting black spots or patches due to pigment. The tissue is quite normal, but increased and condensed, the trabeculæ being also thickened and firm, appearing as white lines. When the spleen is affected in leucocythæmia it is at first congested, the cellular elements at the same time increasing. Ultimately it may attain enormous dimensions, coming to weigh many pounds. As a rule it is abnormally firm, but not invariably. The increase of tissue soon takes place, chiefly in the Malpighian corpuscles, which become much enlarged, their vessels also increasing in number, and they are seen on section as firm, whitish, irregular, scattered nodules, the surrounding pulp being more or less atrophied as they extend, and often much pigmented. The trabeculæ are also considerably thickened. Usually the capsule of the spleen is thickened and opaque, and adhesions often form with neighboring structures. Hemorrhagic infarctions or their remains are not uncommonly seen.

When the *lymphatic glands* are affected they become more or less enlarged, in some cases forming considerable tumors by their aggregation. They resemble in appearance and structure ordinary glands, being soft, and presenting on section a smooth, uniform surface, from which a turbid fluid can be expressed. The cortical portion is much thickened, and microscopical examination only reveals that the normal elements of the gland-tissues are in excess.

In the other organs and tissues mentioned, especially the liver, the changes associated with leucocythæmia are observed in the form of little whitish spots, consisting of a soft adenoid tissue, composed of small cells and nuclei. The liver may be occupied by considerable masses of this substance, causing its enlargement. These deposits are supposed to be mainly derived from infiltration by elements conveyed by the blood from the spleen and glands, but probably they are at least in part due to local hyperplasia of the adenoid tissue normally present.

The changes in the blood are highly important. In the splenic variety of the disease it is found to contain an enormous number of ordinary white corpuscles; in the lymphatic variety, there are abundant small cells and free nuclei, like those in the glands; and in mixed cases, as the disease approaches more one type or the other, does the relative proportion of these microscopical elements vary. Other characters of the blood are marked lowering of its specific gravity; great diminution of red corpuscles, and therefore of iron; increase of water; and in some instances, according to Scherer, the presence of abnormal ingredients, such as are usually found in the spleen, viz., hypoxanthin, lactic, formic, and acetic acids. The proportion of white corpuscles differs in blood taken from different parts of the body, being highest in that of the splenic vein. After death, soft yellow clots are often found in the heart and great vessels, sometimes almost purulent-looking.

SYMPTOMS.—Hypertrophy of the spleen may exist for a considerable time, and to a marked degree, without producing any evident disturbance. In many advanced cases, however, there are signs of marked splenic cachexia. Physical examination usually reveals quite distinctly the enlarged spleen.

In *leucocythæmia* the essential clinical phenomena may be summed up as: 1. More or less intense splenic cachexia, often attaining a high grade. 2. In the majority of cases the *physical signs* of enlarged spleen, in some instances this organ being so hypertrophied as to lead to general enlargement of the abdomen. 3. In a comparatively few cases enlarged masses of lymphatic glands, either externally, internally, or both; and occasionally signs of enlarged liver. 4. Sometimes evidences of pressure by the spleen on surrounding structures, especially the diaphragm. 5. Peculiar changes in the blood. It is the custom to describe the characters of the blood and the clot obtained after a small venesection, but these patients cannot afford to lose blood, and it is quite sufficient to prick the finger so as to get just a drop, and examine this microscopically, when the increase in white corpuscles is immediately perceptible. As a rule no subjective sensations are complained of in the abdomen, except a sense of weight and fulness, but transitory pains may be felt. There are often digestive derangements, and vomiting and diarrhœa may be prominent symptoms. Increased excretion of uric acid has been observed. The course of the disease is very chronic, and, as a rule, there is no pyrexia in the earlier periods, but there may be some irregular febrile disturbance, and towards the close the temperature is often raised persistently. Death may take place gradually from asthenia and exhaustion, frequently preceded by delirium, stupor, and coma; or more speedily from hemorrhage, diarrhœa, and other complications.

OTHER MORBID CONDITIONS OF THE SPLEEN.

1. LARDACEOUS DISEASE.—For the etiology, morbid anatomy, and constitutional symptoms of this condition, reference must be made to the general account already given. All that need be said here is that the deposit is in some cases limited to the Malpighian corpuscles, producing the appearance known as the "sago-spleen," in which translucent granules are observed, like boiled sago. Clinically the enlargement of the spleen is recognized by its very hard and dense consistence, and by its steady growth, the organ finally reaching extreme dimensions in some cases. Other organs are always involved, while there is some constitutional condition present with which albuminoid disease is associated.

2. **Cancer** of the spleen is almost a curiosity. It occurs in the form of nodules or masses of encephaloid, and is always secondary. During life the enlargement is recognized by its irregular and nodular character. Usually pain and tenderness are complained of. Other organs are always involved.

3. **Hydatid tumor** has been in rare instances met with in the spleen, the liver being affected at the same time. It may give rise to a prominence, having the usual semi-globular fluctuating character of a hydatid cyst.

4. **Tubercle** is chiefly met with as a part of acute miliary tuberculosis. Now and then it occurs in cases of chronic phthisis. It cannot be recognized clinically.

5. The spleen is often shrunken and atrophied, but this leads to no ill effects.

General Diagnosis, Prognosis, and Treatment.

Diagnosis.—Practically it is only by *physical examination* that diseases of the spleen can be positively recognized. The chief difficulties attending this have already been indicated. The general symptoms aid the diagnosis materially in advanced cases. In leucocythæmia of course examination of the blood is highly important. The history also helps in some cases, especially if it reveals exposure to malarial influence, or the previous occurrence of attacks of ague. Should there be portal obstruction, enlargement of the spleen is a necessary consequence.

Prognosis.—Acute affections of the spleen are rarely dangerous in themselves. Chronic affections are usually slow in their progress, except in the case of malignant disease, and if there is mere hypertrophy the health is often not disturbed for a long time. It seems almost impossible to reduce this hypertrophy if it once arises. Leucocythæmia is an incurable disease; it lasts a variable time, but its average duration is said to be from 13 to 14 months.

Treatment.—No special interference is needed in acute cases, unless an abscess should form and be recognized, which must be treated in the usual way. Quinine has a marked influence in reducing malarial congestion, even after it has existed for some time. When there is mechanical congestion any impediment must be removed, if possible, but if not saline purgatives act beneficially by relieving the vessels. In hypertrophy and leucocythæmia the chief matter in treatment is to improve the general health and blood-state by iron, mineral acids, quinine, &c., as well as by a nutritious diet, change of air, and attention to hygienic measures. Iodides and bromides have been supposed to reduce the size of the spleen, but, so far as I have seen, they are of no use whatever. Friction over the organ with iodide of mercury ointment has also been recommended. Extirpation of the spleen has been advocated as a last resource. Various symptoms must be treated as they arise.

CHAPTER XLVI.

DISEASES OF THE PANCREAS.

Clinical Characters.—1. Pancreatic affections are frequently attended with *painful sensations*, described as being deep in the abdomen, a little below the epigastrium. The pain often shoots in various directions, and occasionally comes on in violent paroxysms, resembling those of hepatic colic. In some cases there is deep tenderness. 2. Important symptoms are believed to arise from *changes in the quantity and quality of the pancreatic secretion*. When formed in excess, being at the same time generally of an irritable quality, it is supposed by some to be the cause of a form of pyrosis, attended with the discharge of a viscid, slimy fluid; also of diarrhœa, the stools containing a tenacious material, or being sometimes dysenteric. On the other hand, the absence of pancreatic juice from the alimentary canal, or its deficiency, whether arising from changes in the gland tissue, or obstruction in connection with the duct, and also its being of abnormal quality, is considered to give rise to a characteristic phenomenon, viz., the *passage of a large amount of fatty or oily matter in the stools*, which separates from the general mass of the fæces. Frequently, also, there is constipation, the fæces being dry and hard. Other digestive derangements are common, and may be partly due to the absence of pancreatic juice from the bowels. 3. *Pressure upon or irritation of neighboring structures*, is often a cause of prominent symptoms in pancreatic disease, especially jaundice, vomiting, eructations, and other gastric disturbances, and aortic pulsation. The pain is also partly due to this cause in many cases, from pressure on the nerves or vertebræ, the latter being occasionally eroded. 4. *Physical examination* may disclose a morbid condition of the pancreas, but it requires to be performed very thoroughly and often repeatedly, the stomach and colon being empty, before a satisfactory conclusion can be arrived at. The healthy pancreas can now and then be felt on making deep pressure in very thin persons with loose abdominal walls, especially if the spine is somewhat curved forwards; this is more frequently the case when the organ is enlarged and hardened. It is, however, in the detection of a *tumor of the head of the pancreas* that physical examination is of most value. This is distinguished by the following characters: *a.* It is situated *deep* at the back of the abdomen, in the region of the pancreas. *b.* The dimensions are always small, and the shape generally more or less rounded. *c.* The tumor is quite fixed. *d.* It feels dense and hard. It must be mentioned that marked pulsation and bruit may result from pressure of the pancreas upon the aorta. 5. In pancreatic disease there is often extreme emaciation, anæmia, and debility, due to the interference with nutrition and other causes.

SPECIAL AFFECTIONS OF THE PANCREAS.

These will need but a very brief consideration, and some of them only require enumeration.

1. PANCREATITIS.—Acute inflammation of the pancreas is very rare. It is said to be characterized anatomically by hyperæmia, swelling, induration or softening, exudation into the cellular tissue and upon the surface, occasionally ending in purulent infiltration, or formation of abscesses. The last event is said not to be uncommon as the result of metastasis from the salivary glands and testis. Rarely the inflammation ends in gangrene. The *symptoms* are described as dull, deepseated pain in the region of the pancreas, nausea and vomiting of a viscid liquid, thirst, constipation, and some pyrexia. Rupture of an abscess may give rise to serious symptoms.

2. The following morbid conditions may be mentioned together, viz.: *a.* So-called *Hypertrophy*, which generally involves the entire gland, and is the result of chronic inflammation or long-continued mechanical congestion from portal obstruction, the pancreas being enlarged and hardened. *b. Atrophy*, usually associ-

ated with senile changes, some cachexia, local disease of vessels, or pressure by surrounding disease. *c. Induration* or *softening*, with or without hypertrophy or atrophy. *d. Fatty infiltration* and *degeneration.* If these give rise to any symptoms at all, they are those due to the deficiency or abnormal quality of pancreatic secretion. An hypertrophied organ may be felt in some cases, and occasionally it gives rise to pressure symptoms.

3. Not uncommonly *calculi* form in the pancreatic duct, which may be in large number and of some size. They interfere with the escape of the secretion. I am not aware that their passage causes any symptoms. The ducts are sometimes dilated into *cysts.*

4. The chief disease of the pancreas is *scirrhus of the head.* There is a difference of opinion as to the nature of this morbid condition, some pathologists regarding it as the result of cancerous deposit, others considering that it is merely due to fibroid changes, resulting from chronic inflammation, and the latter affirm that the pancreas is peculiarly free from cancer, escaping often even when it exists all around. I have had the opportunity of observing five cases of this disease, and of making a post-mortem examination in four of them, and certainly in most of these the specimens presented well-marked general and microscopic characters indicative of scirrhus cancer. The mass varies in size, but does not attain large dimensions; it has an extremely hard and dense consistence, and a whitish section. It frequently becomes adherent to and involves the duodenum, which may be ulcerated and greatly narrowed. It also may form adhesions with other structures, to which the disease may extend. The pancreatic and biliary ducts as a rule become obstructed. The latter is usually supposed to be closed owing to pressure upon it by the enlarged pancreas, but this is probably more frequently due to contraction about the orifice, or in the course of the duct, from changes in itself; jaundice and its accompaniments necessarily result. The body of the pancreas is usually enlarged, sometimes it is atrophied. Now and then serious disorganization of neighboring parts occurs, leading to erosion of the vertebræ, perforation of the diaphragm, or the opening of a large vessel.

But little is known about the causes of this disease. Generally it occurs in elderly persons, but one of the most marked cases I have met with was in a young man aged 23. In only one instance was there any history of intemperance.

The *clinical history* of these cases is decidedly indefinite and uncertain. In general terms its clinical phenomena may be stated as deep pain in the region of the pancreas, aching, gnawing, or lancinating, or sometimes attended with a sense of burning or tightness, in some cases greatly increased paroxysmally, and also frequently rendered worse by food, coughing, deep breathing, movement, or lying on the back; deep tenderness; nausea and vomiting, in some cases severe; various digestive disturbances, the tongue, however, being often quite clean; jaundice, frequently intense; the passage of much fat in the stools, the bowels being usually constipated; the detection of a tumor having the characters already described; with great wasting, anæmia, and debility. As showing the irregular character of these cases, it may be mentioned that there may be no pain or tenderness from first to last; that symptoms due to biliary obstruction may be the only prominent phenomena throughout; that it may be impossible to detect any tumor; and certainly that excess of fat in the stools is by no means always observed.

Among exceedingly rare morbid deposits in the pancreas are mentioned *encephaloid cancer*, *colloid*, *melanosis*, and *tubercle*.

DIAGNOSIS.—It is only disease of the head of the pancreas that can be at all diagnosed with any approach to certainty, and in many cases it is very difficult to do this, at all events for some time. The chief diseases for which it may be mistaken are affections of the stomach, especially about the pylorus, duodenum, and liver. The paroxysms of pain may closely resemble those associated with the passage of a gallstone. Occasionally by pressing on the abdominal aorta, this disease gives rise to pulsation and bruit, simulating an aneurism. Whenever any of the symptoms described are complained of, *especially jaundice coming on without any obvious cause, pancreatic disease should be always borne in mind.* I believe it not uncommonly escapes recognition, simply because it is never thought of. I quite agree with those who affirm that an important element in diagnosis is to exclude as far as possible affections of the neighboring structures. It must be remembered that the liver is liable to be enlarged as the result of the obstruction of the ducts associated with pancreatic disease. *Physical examination* is most important in diagnosis, and in doubtful cases it should be *thoroughly carried out again and again*, by which a satisfactory conclusion can in many instances be arrived at in time.

PROGNOSIS is necessarily serious in cancer of the pancreas, the disease being fatal, and seldom lasting long.

TREATMENT must be entirely symptomatic, directed against pain, vomiting, jaundice, the loss of flesh and strength, &c.

CHAPTER XLVII.

DISEASE OF THE SUPRARENAL CAPSULES—ADDISON'S DISEASE.

CLINICAL HISTORY.—Dr. Addison first drew attention to a series of symptoms which he believed were associated with disease of the suprarenal bodies, and before considering certain pathological questions relating to this subject, it will be convenient to point out what these symptoms are. One of the most prominent phenomena consists in a *peculiar cachexia*, which sets in gradually without any obvious cause, characterized by increasing debility, languor, and indisposision for any bodily or mental effort, at last amounting to extreme prostration; marked anæmia, the sclerotics being pearly-white; wasting, but not to any degree, nor is it always observed; feebleness of the heart's action, the pulse becoming very soft, weak, and compressible, and there being a tendency to faintness, sometimes amounting to prolonged attacks of syncope. Another characteristic feature is a *discoloration of the skin*, which assumes the so-called *bronzed* appearance. This is due to the presence of pigment-granules in the *rete mucosum*, or occasionally of pigment-cells. The exact hue varies, and it becomes darker by degrees. It often resembles that of a mulatto, but may be simple dingy or smoky, or brown, yellowish, grayish-black, &c. It extends all over the body, but usually commences and is most marked over exposed parts, as the face and neck, also on the upper extremities, in the axillæ, and about the penis, scrotum, and navel. The palms and soles sometimes present spots of pigment. The mucous membranes are also discolored, the lips in some instances assuming a mulberry hue, or spots of pigment being observed on them and on the inside of the cheeks, with dark streaks opposite the angles of the mouth; a peculiar pigment has also been described in the structures of the eye, as seen with the ophthalmoscope. In addition to these symptoms there is usually more or less *pain in the epigastrium*, in some cases extremely severe, with *vomiting*, which may be urgent. Other digestive disorders are also common, and obstinate diarrhœa sometimes sets in. The course of the disease is slow and chronic as a rule, and death generally takes place by a gradual asthenia, occasionally preceded by grave nervous disturbances. In exceptional instances the progress is acute and rapid.

PATHOLOGY.—There are several points in connection with the symptoms just described, about which there is much difference of opinion. The chief attention has been given to the *bronzing of the skin*, and it is still a question what the relation of this phenomenon is, if any, to suprarenal disease. There cannot be a doubt but that complete destruction of these bodies may occur without any such discoloration; and on the other hand this has been observed where there was no suprarenal mischief. Hence some pathologists refuse to acknowledge any relationship between the two things. Again there is a difference of opinion as to whether the bronzing is associated with *all* forms of suprarenal disease, or only with one special variety. The morbid changes which may be met with in these bodies are—1. Acute inflammation ending in suppuration. 2. Tubercle. 3. Cancer, always secondary, and usually of the encephaloid variety. 4. Amyloid disease. 5. Fibroid degeneration with hardening. 6. Fatty degeneration. 7. Atrophy. 8. Hemorrhage. 9. Peculiar alterations described as being associated with bronzed skin. Dr. Wilks describes this as consisting at first in some enlargement of the capsules and the deposition of a grayish, semi-translucent, softish, homogeneous substance, which afterwards undergoes fatty degeneration, becoming converted into a yellowish, opaque material, and this may ultimately become almost fluid, resembling pus, or calcification may take place, a putty-like material being produced, or finally a dry chalky mass. Some regard these changes as due to chronic inflammation, followed by caseous degeneration of the products. It is in connection with this last morbid condition that the peculiar clinical phenomena of suprarenal disease are stated to be particularly observed. Bronzing only occurs late in the case, hence its absence in some instances has been accounted for by the progress of the disease being too rapid, death taking place before the discoloration could be developed.

Besides the changes in the suprarenal bodies, other morbid conditions have been observed in some cases where the symptoms mentioned were present, especially alterations in the solar plexus and semilunar ganglia, and atrophy of the mucous coat of the alimentary canal, with degeneration of the glands. These have been considered as having an important influence in the pathology of this affection, particularly the changes in the sympathetic nerve, branches of which are also very abundant in the suprarenal bodies. The blood has only been properly examined in a few cases, and it has been stated to contain a large excess of white corpuscles.

There can be no doubt but that this subject requires far more extended investigation than it has yet received, before the different pathological questions are determined with any certainty. It is necessary to examine more thoroughly *all* the organs and structures, and not merely the suprarenal capsules. Aitken suggests that all the viscera should be specially examined with the view of detecting *amyloid degeneration.*

Diagnosis.—It is only necessary to mention that should symptoms of failing health and cachexia appear, without any evident organic mischief to account for this, Addison's disease ought to be remembered. When the *bronzing* appears, there is no doubt about the nature of the case.

Prognosis is very grave, the disease always ending fatally, but a case may go on for a long time.

Treatment.—All that can be done is to promote health and strength by a highly nutritious diet; tonics, especially quinine, tincture or syrup of the phosphate of iron, and strychnia; general hygienic measures; and by maintaining the alimentary canal in order. Symptoms must be attended to as they arise.

CHAPTER XLVIII.

ABDOMINAL ANEURISM.

THE most important form of abdominal aneurism which comes under the notice of the physician is that connected with the aorta, but one may be found on the cæliac axis or its branches, especially the hepatic, on the mesenteric or renal arteries, or iliac vessels. It is unnecessary to add anything as to the pathology and anatomical characters to what has already been written in the chapter on thoracic aneurism.

SYMPTOMS AND SIGNS.—In many cases the only clinical indications of abdominal aneurism consist in the detection of a tumor, having the usual characters of an aneurism. Often, however, there are signs of pressure on surrounding structures, with local morbid sensations, and evidences of serious constitutional disturbance, *and these may be alone present, there being no physical signs of an aneurism*, or only such as are very obscure. The *physical characters* of an aneurismal tumor are as follows: 1. It is usually seated in some part of the course of the aorta, but frequently projects more to one side than the other, especially towards the left. Of course it may be in other parts, corresponding to any vessel affected. 2. As a rule, the shape is more or less rounded, the surface smooth, and the tumor yields somewhat on being compressed. 3. Almost always it is quite fixed and immovable, being unaffected by respiratory movements, though if it is very large it may interfere with these movements. 4. One of the most important characters is the presence of a variable degree of *pulsation*, synchronous with the cardiac systole usually, but sometimes also diastolic, distinctly *expansile*, tending *laterally* as well as forwards, and not uncommonly more to one side, occasionally attended with a *thrill.* 5. *Percussion* reveals *dulness*, corresponding to the extent of the tumor, with a sense of much resistance. 6. In many cases there is a *systolic* murmur, which is sometimes very loud and harsh, but this is by no means always heard, or it may be very slight, or more like a sound, and it is occasionally seated beyond the aneurism. There is never any diastolic murmur. The murmur is often influenced considerably by posture and pressure.

There are a few points of practical importance which demand notice. 1. The signs may be most evident *in the back*, and it is always essential to make careful examination here, if aneurism is suspected. Sometimes there is no obvious sign *except a murmur* in this region. 2. There is no relation between the size of an aneurism and the degree of pulsation or murmur. 3. Occasionally the tumor is movable, and not uncommonly both pulsation and murmur are considerably influenced by *posture*, hence it is necessary to examine in different positions. It is important, however, to observe that the impulse does not, as a rule, disappear when the patient is placed in a kneeling attitude supported on the hands. 4. The physical signs may change considerably in the progress of the case.

The *pressure-symptoms* will vary with the situation of the tumor. Among the most common are neuralgic pains, sometimes extremely severe, shooting in different directions, from pressure on nerves, this occasionally also causing permanent contraction of the flexors of the hip-joint; deep gnawing pain, from erosion of the vertebræ; anasarca of one or both legs, with distension of the superficial veins, due to pressure on the vena cava, or one of the iliacs. In some cases micturition is affected at times, and albuminuria may occur from pressure on the renal veins. Wasting of the testis has been noticed from obliteration of the spermatic artery. Aneurism of the hepatic artery must be borne in mind as a possible cause of jaundice and ascites, by pressing on the neighbouring duct and portal vein.

In some instances patients have a subjective feeling of uncomfortable pulsation. The alimentary canal is often out of order, and I have known obstinate constipation to be the prominent symptom complained of in a case of aortic aneurism. Patients frequently look well, and their general condition is satisfactory, but sometimes they present a very peculiar aspect, indicating profound illness, with anæmia, even when there are no distinct physical signs of aneurism.

DIAGNOSIS.—The chief conditions which may simulate aneurism are—1. Simple aortic pulsation. 2. The pancreas or a solid tumor transmitting an impulse from the aorta, or giving rise to a murmur by pressure. 3. A fluid accumulation, such as hepatic abscess or hydatid tumor, receiving an impulse from the aorta. The diagnosis must be founded on a careful consideration of all the features of the case, as regards history, symptoms, and physical signs, but it is important to notice that in all these cases the pulsation is *but rarely expansile*, and both it and any murmur generally disappear if the patient is placed in a kneeling attitude supported on the hands. The diagnosis from mere *aortic pulsation* requires a few words of special comment. The chief facts in favor of this condition are as follows: 1. It is generally seated in the epigastrium. 2. It is observed chiefly in highly nervous and anæmic persons, especially women, in very thin individuals, or in those who suffer much from dyspepsia. 3. There are no signs of pressure, nor is there any pain or tenderness as a rule. 4. The impulse is scarcely ever *expansile* and *lateral*, but merely tends in a forward direction, and is never attended with a thrill; there is no increase in dulness, or any evident tumor, and if a murmur is present, it is soft and blowing or whiffing, never harsh or loud. Some cases are difficult to diagnose with certainty, and then the progress of the case must be watched, and the effects of treatment observed.

It must not be forgotten that an aneurism may exist without giving rise to any physical signs. Occasionally, also, it presents the characters of a solid tumor without any pulsation or bruit. If obscure abdominal symptoms are complained of, particularly *deep pain near the spine*, and especially if the constitution shows signs of being gravely disturbed, aneurism should be thought of, and a careful examination made repeatedly, *behind* as well as in front.

TREATMENT.—In addition to what has been previously stated regarding the treatment of aneurism, it is necessary to allude to a special method introduced for the cure of aneurism of the abdominal aorta, viz., the *rapid-pressure* treatment, first employed by Dr. W. Murray of Newcastle-on-Tyne. The plan is to keep the patient well under chloroform, and apply a tourniquet over the aorta above the tumor, maintaining *steady* and *constant* pressure until all pulsation has ceased in the aneurism on removing the tourniquet. The blood coagulates in the sac, and afterwards collateral circulation is set up. The results of this treatment are certainly such as to recommend its adoption in appropriate cases, if other measures do not appear to be producing good effects. If the aneurism is high up, *distal pressure* may possibly be of service. *Pain* is a symptom often calling for interference, and is best relieved by subcutaneous injection of morphia. *Posture* may influence it considerably. It is highly important to attend to the state of the digestive organs. A belladonna plaster should be worn constantly over the aneurism.

CHAPTER XLIX.

DISEASES OF THE URINARY ORGANS.

CLINICAL CHARACTERS.—1. The *morbid sensations* connected with the urinary organs may be referred to the lumbar regions, in the direction of the ureters, to the hypogastrium, or to some part in the course of the urethra. The chief include different kinds of pain, tenderness, uneasiness, fulness or tension, heat or burning along the urethra, itching or tickling at the end of the penis. With respect to pain, it is important to ascertain whether it is increased by movement of the body, especially by sudden jolts, as after walking, jumping, riding, driving, &c.; if it is affected by the act of micturition, being either relieved by this, or intensified, or even only complained of during or after this act; and if it is influenced by any articles of diet or drink. Not uncommonly a sympathetic pain is felt along the spermatic cord to the testis, which may be retracted.

2. *The act of micturition* is frequently disturbed; the principal deviations being a too frequent or almost constant desire to pass water, some-

times coming on suddenly, so that the patient cannot retain the urine an instant, or, on the other hand, being combined with more or less dysuria or strangury; simple dysuria even to complete retention; incontinence, the urine coming away involuntarily, either constantly or only at times, especially at night during sleep. The stream of urine may present abnormal characters. The amount passed may also vary greatly from health, being diminished to actual suppression, or increased.

3. Important symptoms associated with certain renal affections result from an abnormal state of the blood induced by them, especially *dropsy*, and the phenomena grouped under the term *uræmia*. The latter will be presently treated of in detail.

4. When the kidney is enlarged, it occasionally gives rise to symptoms by pressing on adjoining structures.

5. *Rupture* of the kidney or bladder will occasion serious consequences, especially when attended with extravasation of urine.

6. *Physical examination* connected with the urinary organs includes: *A. Examination of the urine; B. Investigation for renal tumor; C. Examination directed to the bladder and urethra*, externally; by the use of the catheter, sound, and endoscope; and through the rectum and vagina. For an account of the last mentioned reference must be made to surgical works.

A. EXAMINATION OF THE URINE.—This is a matter of the deepest importance, and is even at the present day but too much neglected in ordinary practice. It gives valuable information in other affections besides those of the urinary organs, and in the succeeding remarks it is proposed to give a concise outline of the mode in which the clinical investigation of this fluid is to be conducted, which has been mainly gathered from Dr. W. Roberts's most valuable work. It need scarcely be remarked that a previous knowledge of the characters of the urine in health is requisite, and also of its composition, with the average proportion of its chief constituents, and the main physiological variations to which they are liable; the changes which the urine undergoes on standing must also be remembered.

(i.) *General Examination.*—The first thing to be done with any specimen of urine is to observe its *physical characters*, including color, and general aspect, clearness or turbidity, consistence, characters of the froth on shaking, odor, reaction, specific gravity, and whether there is any deposit. It is often of much importance to *measure the quantity* passed in the twenty-four hours, and in taking the specific gravity or making quantitative analyses, a specimen from a mixture of the whole of this should be employed. The *reaction* ought to be taken as soon as possible after the urine has been passed, by means of turmeric and blue, green, or violet-tinted-litmus-papers. Should it be alkaline, it is requisite to determine whether this is due to fixed alkali or ammonia, which is proved by drying the test-paper in the open air, when, if the alkalinity depends on ammonia, this evaporates, and the paper is restored to its former color. Further, it is very important, should the urine be ammoniacal, to ascertain whether it is discharged in this condition, or if it arises subsequently from decomposition, and how soon. The *specific gravity* is ascertained by the *urinometer*, and care must be taken that this does not touch the sides or bottom of the glass containing the urine, and that the number on the stem which represents the density is read off by looking at it on a level with the surface of the liquid.

(ii.) *Chemical Examination.*—This is carried out with the view of determining: *a.* The presence and proportion of certain normal constituents of urine, especially urea, uric acid, hippuric acid, chlorides, phosphates, and sulphates. *b.* The presence and quantity of abnormal organic ingredients, chiefly bile, albumen, sugar, pus, and fat. *c.* The nature of any deposit. *d.* The existence of various substances introduced into the body from without, such as lead or arsenic. It is desirable to point out the tests employed for some of these materials.

UREA.—The *qualitative test* for this substance is to add *pure nitric acid* to some of the fluid carefully concentrated by evaporation in a water-bath, when a crystalline precipitate of *nitrate of urea* is thrown down, the crystals of which appear under the microscope as flat rhombic or hexagonal plates. *Quantitative Estimation.*—An approximate knowledge of the amount of urea excreted daily, sufficient for ordinary clinical purposes, is obtained by collecting the whole of the urine passed in the twenty-four hours, and taking the specific gravity of a mixed specimen, provided it does not contain sugar or albumen. A table has been drawn up by Professor Haughton, showing the relations between the quantity of urine, its specific gravity, and the amount of urea. For accurate determination the *volumetric method of Liebig* is that generally employed. It depends upon the fact that urea forms with mercuric nitrate a precipitate of definite composition. For this process, three solutions are required, viz., 1. One consisting of a volume of a cold saturated solution of barytic nitrate with two volumes of saturated baryta-water. 2. A standard solution of mercuric nitrate. 3. A solution of carbonate of soda, about gr. xx to ℥i. A measured quantity of the urine is first mixed with half its bulk of the baryta solution, in order to precipitate the sulphates and phosphates, which are separated by filtration, a drop or two of the filtrate being further tested to see that these are entirely removed, and if they are not more baryta solution must be added. A certain quantity of the filtrate is then taken, and the mercurial solution *very cautiously* dropped into it from a graduated burette until it begins to become turbid, the amount required to produce this effect being noted down. No precipitate falls until all the chloride of sodium present has been decomposed, and the quantity required for this must be subtracted in the subsequent calculations from the total volume added. As soon as a precipitate forms, the mercurial solution is to be allowed to flow in freely at first, and afterwards again gradually, the mixture being stirred with a glass rod. In order to ascertain when the whole of the urea has been precipitated, a little of the carbonate of soda solution is placed on a white porcelain surface, and a drop of the precipitated mixture added to it by the aid of a glass rod; as soon as a yellow tinge is thus produced, it indicates that the whole of the urea has been thrown down. The matter then becomes merely one of calculation, the mercurial solution being of such a strength that each cubic centimetre used *after the decomposition of the chlorides* corresponds to 0.01 gramme of urea.

Uric Acid.—The test for the presence of uric acid is to place a little of the substance supposed to contain it on a porcelain dish, add a little nitric acid, evaporate over a spirit-lamp until a yellowish-red residue is left, and finally touch this when cold with a glass rod dipped in solution of caustic ammonia. A characteristic bright violet color is immediately produced, due to the production of murexid. To obtain the acid from urine, it is requisite to add excess of strong hydrochloric or acetic acid to a specimen, and let it stand for 24 hours. The uric acid is then precipitated in a crystalline form, and may be tested as above. This is also the method usually followed for its *quantitative estimation*, though it is not very accurate, a measured quantity of urine being taken, and the precipitate collected on a weighed filter, which is afterwards dried and weighed.

With regard to the *inorganic acids*, it can only be stated that phosphoric is best recognized by the ammonio-magnesian test; hydrochloric by argentic nitrate; and sulphuric by barytic nitrate. The *quantitative estimation* of these substances presents so many practical difficulties, and their proportion is liable to so many variations from different causes, that its consideration would be quite beyond the province of this work.

Albumen.—The two reliable tests for albumen are *heat* and *nitric acid*, by which it is coagulated and precipitated.

Heat.—This test is best performed by placing some urine in a test-tube, and heating its upper portion by means of the spirit-lamp, this being then compared with the lower part, and thus the slightest opalescence can be detected. There are some important precautions to be observed. 1. It is essential to see that the *urine is acid*, and should it be alkaline a few drops of *acetic acid* must be added. 2. The portion of urine employed should be quite transparent and clear, and if there is any permanent turbidity it ought to be filtered; but when this is due to urates, all that is necessary is to pass the tube two or three times along the flame, by which these are immediately dissolved, and then the upper part may be further heated. 3. The portion that is being tested must be *boiled*, as when the proportion of albumen is small it is only then that cloudiness is observed. The rapidity of coagulation is in proportion to the quantity of albumen present. 4. After heating it is well to add a drop or two of nitric acid, as, if the urine is only faintly acid, earthy phosphates may be precipitated and thus give rise to turbidity. These, however, are immediately dissolved by the acid.

Nitric Acid.—The addition of this acid to *cold* urine is, with certain precautions, a very delicate test for albumen. The plan is to place some urine in a test-tube, incline the latter, and gradually pour strong acid down along its side, so that from its higher specific gravity it may sink to the bottom without mixing It has also been recommended to put some acid in a tube, and pour the urine upon this. *At the junction* of the two liquids more or less turbidity is observed, which *spreads upwards through the stratum of urine.* The chief fallacies with regard to the nitric acid test are as follows: 1. If only a little is *added* to the urine, the albumen may not be precipitated; and, on the other hand, if a considerable quantity is suddenly *mixed* with it, the same result may follow, even though there is much albumen present. 2. Cloudiness may not be observed for two or three minutes if the proportion of albumen is very small, and therefore the contiguous strata must be watched for this period. 3 If the urine is highly concentrated, the addition of nitric acid is liable to cause precipitation of urates; in this case, however, *the cloudiness begins at the surface of the urine, and spreads downwards, while heat dissolves the precipitate instantly.* 4. When there is great excess of urea, the acid may cause its precipitation, but this occurs *very slowly*, and the deposit is crystalline. 5. Opalescence of the urine may be due to cubebs or copaiba, and this is sometimes increased by adding nitric acid. They are recognized by their odor, and by the effects of heat, which diminishes the opalescence and prevents any turbidity with nitric acid.

Quantitative Estimation—For ordinary clinical purposes a sufficiently exact estimation of the amount of albumen present in a specimen of urine may be obtained by adding a little acetic acid to some of it in a test-tube, boiling, and then setting the specimen aside, until the coagulated particles have all subsided, when the depth of the deposit can be compared with that of the urine, the proportion being expressed as "almost solid," ½— ⅛th, or as mere "cloudiness," or "a trace." Sometimes the precipitate from a measured quantity of the urine is collected on a weighed filter, which is washed, dried, and again weighed. Other methods have been employed, but they need not be described. Before estimating the amount of urea and other urinary ingredients, it is requisite to remove any albumen present, by carefully acidulating with acetic acid, heating *just to boiling-point*, and filtering.

The chief causes of *albuminuria* are: 1. Admixture of blood or some of its elements, chyle or lymph, pus from any source, or semen. 2. Renal congestion, particularly mechanical, due to *obstructive cardiac diseases*, chronic lung affections, or *pressure upon the renal veins* by a tumor or a *pregnant uterus*. 3. Acute febrile and inflammatory diseases, *e. g*, the exanthemata, cholera, diphtheria, pyæmia, ague, pneumonia, serous inflammations, rheumatic fever, and the pyrexia which occurs in the course of chronic diseases, such as phthisis; also certain affections attended with an unhealthy state of the blood and relaxation of the tissues, as purpura and scurvy, these conditions being supposed also partly to account for its occurrence in pregnancy. 4. *Acute and chronic Bright's disease*, the albuminuria being then mainly due to organic changes in the kidneys. 5. Chronic lead-poisoning; also poisoning by inhalation of arseniuretted hydrogen or carbonic anhydride. The use of a highly albuminous diet, and some forms of dyspepsia, may cause the urine to become slightly albuminous temporarily.

SUGAR.—Grape-sugar is the variety met with in the urine. It has been stated by many observers to exist in healthy urine, but if so, it is only in such minute proportion as to be practically of no consequence in a clinical point of view.

Qualitative Tests.—1. *Reduction test.* This being by far the most reliable will be considered first. It depends upon the power which grape-sugar possesses of reducing certain metallic oxides to a lower degree of oxidation or to the metallic state. A salt of copper is usually employed, the cupric oxide being reduced to cuprous, which falls as a precipitate. There are two chief modifications of the test, viz., Trommer's and Fehling's. *a. Trommer's.* A drop or two of a weak solution of cupric sulphate is added to some of the urine in a test-tube, and then about half its bulk of liquor potassæ, care being taken that sufficient is added to dissolve all the copper salt. On boiling this mixture, which should be quite clear and free from any precipitate, and of a bluish or bluish-green color, an orange-red precipitate of cuprous oxide falls, which subsequently changes to reddish-brown. This method is not satisfactory for several reasons, and Fehling's is much more reliable. *b. Fehling's.* Here a *standard solution* is made use of, composed of cupric sulphate (40 grammes); potassic tartrate (160 grammes); liquor sodæ, of sp. gr. 1.12 (750 grammes); with distilled water to 1154.5 cubic centimetres. This is very prone to decompose, racemic acid being produced from the tartaric, which also reduces cupric oxide, and therefore it should be always kept in completely-filled, thoroughly-stoppered bottles, in a cool place, away from the light. The proper mode of using this test-solution is as follows: A drachm or two of it is placed in a tube and heated over the spirit-lamp until it boils; if any decomposition has taken place, a precipitate of cuprous oxide will be thrown down in a minute or two, and if this happens, the test-solution is unsatisfactory, and it is best to prepare a fresh specimen. When the solution is satisfactory, if the urine is supposed to contain a considerable amount of sugar, *a drop or two* of it is to be added *while the solution is boiling*, when a brick-red precipitate of cuprous oxide falls immediately, and if more urine is added the deposit becomes yellow. Care must be taken under these circumstances *not to add too much urine*, as great excess of sugar will cause the precipitate to be redissolved, producing a clear, yellow solution. If there is only a small proportion of sugar present, the urine must be poured in until *nearly as much as the quantity of test solution employed* has been added, but on *no account must the quantity exceed an equal bulk.* The mixture is again to be boiled, when, if a small quantity of sugar is present, it assumes an intense opaque yellowish-green appearance, and slowly a bright yellow deposit subsides. If there is no immediate precipitation, the mixture must be set aside in a warm place to cool gradually, when, if only a very minute proportion of sugar is present, it by degrees loses its transparency and assumes a light-greenish opacity or milkiness, which is quite characteristic (W. Roberts). It is highly important *to avoid boiling for any length of time*, as this is quite unnecessary, while uric acid and other urinary ingredients have the power of reducing cupric oxide after prolonged boiling.

2. *Moore's Test.*—This consists in mixing equal quantities of the suspected urine and liquor potassæ in a test-tube, and boiling the upper portion. A change of color is observed to a more or less deep-brown, or, if there is much sugar present, it may become almost black. This is by no means a reliable test, for it cannot detect small quantities of sugar, and urine which is concentrated and high-colored, or which contains excess of phosphates or much albumen, will become darkened on boiling with liquor potassæ, and this is particularly the case with markedly albuminous urine, if the liquor potassæ has become impregnated with lead from having been kept in glass bottles.

3. *Fermentation Test.*—A small quantity of German yeast is placed in a test-tube, which is then quite filled with the urine, inverted over a shallow dish or saucer containing some of the same, and set aside in a warm place for some hours. If sugar is present fermentation goes on; carbonic anhydride is set free and collects at the top of the tube, gradually expelling the urine. The gas may be tested by a lighted taper. This is not a delicate test. Dr. W. Roberts makes use of the *loss of specific gravity* in the urine after having undergone this process, both for indicating the presence of sugar and its amount.

4. *Hassall's Test.*—Dr. Hassall considers the *growth of the yeast-plant* (Torula cerevisiæ) in urine, visible on microscopic examination, as certain evidence of the presence of sugar. There are several reasons why this test is not very practicable.

Quantitative Estimation.—For diabetic urine, where a large quantity is passed daily, the *specific gravity* will give an approximate idea of the proportion of sugar discharged. For accurate analysis, however, the following are the chief methods adopted. 1. *Volumetric analysis.* 10 c.c. of

Fehling's solution are placed in a flask and boiled, and some of the urine, either alone or diluted with a certain proportion of water, according to the amount of sugar present, is added by degrees from a graduated burette, until the blue color has entirely disappeared, which can be observed by holding the flask between the eye and the light after each addition, allowing it to stand for a minute so that the sediment may subside. The above anount is decomposed by 1 grain of sugar, and from this the whole quantity of sugar excreted may be determined. 2. *Differential density method.*—The loss of density in the urine after fermentation is considered by Dr. W. Roberts as giving very accurate information as to the quantity of sugar present. *Each degree of density lost corresponds to 1 grain of sugar in every fluid ounce of urine.* 3. The *polariscope* is sometimes employed to estimate the quantity of sugar, provided the urine is transparent, this being determined by the degree to which the *plane of polarization is rotated to the right.*

In both the qualitative and quantitative testing for sugar in urine, it has been recommended first to filter this fluid through animal charcoal.

(iii.) MICROSCOPICAL EXAMINATION.—The objects which may be discovered in the urine by the aid of the microcsope are: *a. Extraneous materials*, such as fragments of cotton-wool or flax, hairs, woody fibres, starch-granules, oil-globules, &c. *b. Unorganized particles*, crystalline or amorphous, including chiefly uric acid and urates, oxalate of lime, phosphates, cystin, xanthin, leucin and tyrosin. *c. Organized bodies*, viz., renal or other epithelium, renal casts, blood-corpuscles, pus cells, cancer cells, tubercle cells (?), fragments of hydatids, pigment, fat, spermatozoa, or low vital organisms, viz., vibriones, mould fungus, torulæ, and sarcinæ. In order to examine deposits microscopically, a quantity of the urine must be set aside in a conical glass, or Dr. Legge recommends a cylindrical one, the supernatant fluid being poured off after standing, and a drop of the sediment then placed on a glass slide. Not uncommonly the microscope is employed also to examine deposits produced during chemical reactions; and, on the other hand, the effects of chemical reagents on objects observed under the microscope sometimes give valuable information.

URINARY DEPOSITS.—It will be well now to consider deposits in urine separately, and to describe the chief characters by which those ordinarily met with are recognized. In examining them, their *general characters* must be first noticed, including their amount, color, and general aspect, mode of aggregation and deposit, whether amorphous, crystalline, or flocculent, and their apparent density and manner of precipitation, which may be observed by shaking up some of the specimen and allowing it to stand. Next they must be submitted to the action of heat, nitric and acetic acids, and liquor potassæ, to test whether they are soluble by these agencies. Finally, some of the sediment must be examined microscopically. The principal deposits, with their main characters, are as follows:

1. *Uric Acid.*—The urine containing this deposit is always very acid: generally it is mixed with urates and forms some time after the discharge of the urine. It is recognized by the naked eye as more or less *brown or brownish-red crystals*, either forming a superficial film, adhering to the sides of the vessel, or falling as a heavy reddish deposit. The crystals are not soluble by heat or dilute acids, but are dissolved by strong alkalies. Chemically they may be recognized by the murexid test; microscopically they are distinguished by their *color* and *form*, the latter being primarily that of a rhombic prism or lozenge with pointed ends, but they present numerous diversities, becoming ovoid or oval tablets, barrel-shaped, quadrangular, cubes, hexagonal, rod-like, stellate, rosette-like, &c. If a drop of liquor potassæ is added they are dissolved at once, but may be reprecipitated as hexagonal plates by adding a drop of acetic acid.

2. *Urates.*—These are very common even in health. As a rule they occur as "amorphous urates," which consist of salts of potash, soda, ammonia, and lime, in variable proportions. The conditions favorable to their deposit are a high specific gravity, very acid reaction, and low temperature. They form more or less speedily after the discharge of the urine. The precipitate is quite amorphous, pulverulent, loose, sinking with tolerable rapidity, and presenting a variable color, such as milky, fawn, orange, pink, deep red, or purplish, owing to the urates carrying down the pigments. A film forms on the surface and sides of the containing glass. *Heat dissolves the precipitate very speedily and completely* and also liquor potassæ. Microscopically it appears as minute amorphous granules, of variable size, more or less dark and opaque. Urates of soda and ammonia are occasionally deposited in a *crystalline* form, the former as a whitish or yellowish sediment which sinks rapidly and usually forms in the bladder; the latter generally as a dense white precipitate in urine which has decomposed and become strongly ammoniacal. They are the form of globular, dark, opaque particles, from which project spi[illegible] crystals, straight or curved. Urate of ammonia also occurs as mi[illegible] dumb-bells.

3. *Oxalate of Lime.*—This forms but a very slight colorless deposit usually in highly colored and acid urine. It crystallizes in fine lines the interior of the glass, while the sediment is described by Dr. Roberts as consisting of two parts—a soft, pale gray, mucus-like portion at the bottom, and overlying this a snow-white, denser layer, with undulating but sharply limited surface. Oxalate of lime is not dissolved by heat, acetic acid, or liquor potassæ, but is speedily soluble in mineral acids. It crystallizes either in the form of minute octahedra, very sh[illegible] in one axis, or as biconcave circular or oval disks with rounded margins. Under the microscope the former vary in appearance according to the

position, but commonly they present a characteristic envelope-like appearance, exhibiting a square surface crossed diagonally by two lines. The latter are presented as dumb-bells, or ovoids and circles.

4. *Phosphates.*—These are deposited in alkaline urine as a rule, but occasionally in that which is neutral or faintly acid. They are not dissolved by boiling, which even increases the precipitate, giving rise to turbidity and causing the phosphates to fall in flakes. A drop of acid dissolves them instantly. Three varieties of phosphates are met with as urinary deposits. *a. Amorphous Phosphate of Lime* or *Bone earth.* This occurs as a whitish, light, flocculent sediment, with a superficial iridescent film. Microscopically it presents irregular groups or patches of minute pale granules. *b. Crystallized Phosphate of Lime* or *Stellar Phosphate.* Of rare occurrence, the crystals assume very various forms, but most of them resemble crystalline rods or needles, distinct or grouped in various ways. *c. Phosphate of Ammonia and Magnesia, Triple Phosphate.* This is the most common form, being generally mixed with the amorphous phosphate. The precipitate is quite white, and brilliant colorless crystals are seen forming a film on the surface and studding the sides of the glass. Under the microscope the crystals are usually very characteristic, appearing as triangular prisms with bevelled ends, but the primary form is liable to numerous variations.

5. *Carbonate of lime* occasionally falls as an amorphous deposit along with phosphates, and it is said to be now and then seen as crystals.

6. *Cystin.*—The urine in which this rare substance is found is turbid on being passed, yellowish-green, having an oily aspect, and a peculiar sweetbrier odor. It is faintly acid, very prone to decomposition, becoming green and evolving hydric sulphide. The deposit on standing appears abundant and light, but it weighs very little. It is not dissolved by heat or acetic acid, the latter causing increased precipitation, but it is soluble in mineral acids and caustic ammonia, being afterwards deposited from the latter solution by spontaneous evaporation. Microscopically the crystals appear as brilliant, colorless, hexagonal tablets, having a pearly lustre, often overlapping each other, or arranged in rosettes, &c. Cystin also crystallizes in square prisms.

7. *Leucin—Tyrosin.*—These are stated to form a greenish-yellow sediment, tyrosin appearing under the microscope as delicate needles grouped in globular masses or bundles; leucin as dark globules, like fat.

8. *Fat.*—The chief condition in which a deposit of fat is observed is in the so-called *chylous urine.* This generally presents a whitish, opaque, and milky aspect, but occasionally it is somewhat bloody. It contains albumen, fibrin, and fat in variable proportions, the latter occurring as extremely fine molecules. On standing a soft coagulum forms in the urine, and the fat collects on the surface as a creamy layer. Ether dissolves the fat and renders the urine transparent The microscope reveals,

in addition to the fat-molecules, granular nucleated corpuscles, resembling chyle-corpuscles. Chylous urine is chiefly met with in tropical climates, in some of which it is endemic. Frequently considerable emaciation and debility accompany this condition. The morbid elements in the urine are generally supposed to be derived directly from the blood in the kidneys, but Dr. W. Roberts believes that they come from the absorbent vessels in the urinary passages, which hypertrophy and give way, so that their cóntents become mixed with the urine.

The material named *kiestein* may be also alluded to here. This is a peculiar whitish pellicle which sometimes forms on the surface of the urine after standing for a few days, and formerly supposed to be a characteristic sign of pregnancy, but it is known now that such is not the case. It consists of abundant fat-globules, crystals of phosphates, and the mould fungus.

9 *Mucus and Epithelium.*—All urines contain a small quantity of these elements, the epithelium coming from the genito-urinary passages. A light cloud subsides on standing, and the cells may be seen on microscopic examination, differing in character according to the part whence they are derived. In some cases the mucus is in considerable excess. It does not become ropy on adding liquor potassæ. From certain diseased conditions the epithelium of the bladder, ureters, pelvis of the kidney, or renal tubules may be present in the urine. The extra-renal cells present such various and curious shapes as to have been mistaken for cancer cells. Renal epithelium cells may be separate or in patches, healthy in appearance, atrophied, granular, fatty, or quite disintegrated. Usually they are associated with casts.

10. *Pus.*—If pus is present in any quantity the urine is turbid on being passed, and does not become clear on boiling. A yellowish-white sediment forms, and if the urine is ammoniacal, or if liquor potassæ or ammoniæ is added, the pus assumes the characters of a ropy, viscid, tenacious material, which can be drawn out into strings. There is necessarily some albumen present, but it is never abundant when due to pus alone. Under the microscope pus-cells are seen, but they are frequently much altered in decomposed urine. The sources of pus in the urine are: 1. Abscess in the kidney. 2. Pyelitis. 3. Cystitis. 4. Urethral inflammation, especially from gonorrhœa. 5. Leucorrhœa in females. 6. The rupture of any neighboring abscess into the urinary passages.

11. *Blood—Hæmaturia.*—Urine only containing a little blood may not give any indication of this to the naked eye, or it often presents a characteristic smoky appearance; when more abundant it has a more or less deep pink or red color, until it may look like pure blood. Sometimes the blood is separate from the general mass of urine, and it may be in distinct coagula, or these may form on standing. A brownish, grumous, flocculent deposit falls after a time. The urine is necessarily albuminous. Red corpuscles

are visible on microscopic examination, but if the urine is very dilute they are liable to be distended and thus lose their normal characters; or if it is ammoniacal they speedily alter in shape and break up. Vermiform coagula or casts may be visible under the microscope. For purposes of diagnosis it is highly important to notice whether the blood is constantly passed or only at intervals, or under certain circumstances, as after riding, jolting, or taking certain articles; the mode of its discharge, whether before or after the urine or along with it, and also if it escapes independently of micturition; its amount; and the degree to which the urine and blood are mingled, whether they are intimately mixed, or more or less separate, or if the blood is in coagula.

ETIOLOGY.—The blood in hæmaturia may come from the kidneys, pelves or ureters, bladder, urethra, or, in females, it may be connected with uterine and vaginal hemorrhage, including ordinary menstruation. Excluding the latter the causes may be arranged as: 1. *Traumatic*, *e. g.*, external injury affecting any part of the urinary apparatus, severe exercise and straining, injury by instruments, and *laceration of the mucous membrane of the pelvis of the kidney*, *ureters*, *bladder*, *or urethra by a calculus.* 2. *Renal affections*, viz., congestion, including the active hyperæmia induced by certain articles, especially turpentine and cantharides, acute Bright's disease, suppurative nephritis, cancer, tubercle, renal embolism, minute calculi in the tubules, hydatids and other parasites. 3. *Affections of the pelvis or ureters*, viz., cancer, tubercle, and parasitic disease. 4. *Affections of the bladder*, viz., congestion, acute cystitis, cancer, especially if of a villous and fungous nature, varicose veins. 5. *Gonorrhœa* and other *urethral* inflammations. 6. *Endemic.* This calls for special notice, being a form of hæmaturia observed in certain hot climates, especially the Mauritius, though it has now been proved to be due to a small parasite (Bilharzia hæmatobia), which affects the mucous membrane of the pelvis of the kidney and bladder. 7. *Abnormal conditions of the blood*, particularly in purpura and scurvy, also in malignant fevers, cholera, &c. 8. *Vicarious*, chiefly of the menstrual discharge. 9. *Mental emotion*, in rare instances.

The characters of the hæmaturia in connection with most of the local lesions mentioned, will be hereafter pointed out. At present all that need be said regarding the diagnosis is, that in *renal hœmaturia* the blood and urine are intimately mixed, the color being frequently smoky, and under the microscope minute moulded coagula or casts are usually visible, being in some cases numerous and decolorized, and accompanied by other renal structures; in bleeding from the *pelvis and ureters* there is also an intimate mixture, and moulded vermiform coagula of considerable length may be discharged; in the *vesical* form the blood is expelled chiefly or only towards the end of the act of micturition; while in the *urethral* variety it may escape or be pressed out independently of micturition, and when urine is passed, blood precedes it or colors the first portion, and then the urine may become quite clear, blood again appearing at the close. It may, however, flow back into the bladder from the urethra, and thus color the urine contained in this organ. Blood is sometimes purposely mixed with urine by hysterical patients and malingerers.

TREATMENT.—This must be conducted on exactly the same principles as that of other hemorrhages. The most valuable internal astringents in hæmaturia are gallic or tannic acid, acetate of lead, and dilute sulphuric acid freely administered, combined with a little opium. The subcutaneous injection of ergotin deserves trial. The local use of cold is also highly beneficial often, in the form of ice to the loins, hypogastrium, or perineum, or cold injections into the bladder; astringent injections are also permissible in some forms of vesical hemorrhage. Dry cupping over the kidneys is often very useful when the blood comes from these organs, and occasionally local removal of blood is permissible. Pressure can be applied in the case of urethral hemorrhage, and for this purpose it may be requisite to pass a catheter or sound. After renal hæmaturia it is important to watch the case for some time, as coagula may remain in the tubules and set up serious mischief.

HÆMATINURIA.—The urine occasionally contains more or less of the coloring matter of blood, with albumen, but no corpuscles or fibrin, and to this condition the above term has been applied. This has been observed in connection with septic and malignant fevers, occasionally in purpura and scurvy, after poisoning by arseniuretted hydrogen or carbonic anhydride, and as a distinct affection, named *paroxysmal* or *intermittent hæmatinuria*, which seems to be chiefly caused originally by cold, but has also been attributed to injury over the renal region, and exposure to malaria. Pathologically it has been supposed to be due to the red corpuscles in the blood being disintegrated and dissolved; or to a nervous disturbance leading to temporary dilatation of the renal vessels, with escape of some of their contents without rupture. It is highly probable that in some of the cases described, corpuscles have been present in the urine originally, which have subsequently broken up and become dissolved.

Intermittent hæmatinuria comes on in sudden and usually irregular paroxysms, varying much in their frequency in different cases, only occurring during the day, and generally lasting for from three to twelve hours, being preceded for a brief period by chills or rigors, languor, weight or dull pain over the kidneys, pain or stiffness in the legs, occasionally retraction of the testicles, nausea, and vomiting. As a rule there is no pyrexia, and the temperature is in some cases below the normal. The urine becomes very dark, like porter or port wine, usually turbid, highly albuminous, and deposits a chocolate-colored sediment, which, microscopically, is seen to consist chiefly of granular matter, with sometimes hæmatin crystals, and often a few dark granular casts, and oxalate of lime. In the intervals the urine seems quite normal, and the change to this condition may be also quite sudden. In the *treatment* of this complaint, full doses of quinine and iron have been of most service.

12. *Renal Casts.*—Materials are exuded into the tubules in certain affections of the kidneys, which coagulate there, forming moulds or casts, which are washed away by the urine, and give information, when viewed under the microscope, of the highest importance as regards the condition of these organs. As a rule they form but a slight cloudy sediment, but sometimes a considerable white deposit falls. Microscopic examination can alone positively reveal the presence of casts, and it is advisable to make this on a few occasions before coming to any positive conclusion, and also to repeat it frequently during the course of a case. In some instances it has to be conducted with the greatest care before they are detected, and it has been recommended to add acetic acid, so as to precipitate uric acid, which will carry down the casts along with it.

The chief varieties met with are as follows, two or more kinds being commonly observed together: *a. Blood casts*, consisting either of accumulations of corpuscles, or of fibrinous casts studded with these. *b. Epithelial casts* usually of some size, and presenting renal epithelium-cells on the surface or imbedded in their substance, frequently somewhat changed from their normal condition. *c. Granular casts*, usually of moderate size, and characterized by being more or less granular and opaque in appearance, the granules being either coarse or fine, and consisting of protein or fat; these are generally mixed to a variable degree with other elements, such as altered epithelium, oxalates, &c., and also with free granules. On the addition of acetic acid under the microscope, if the granules consist of protein they disappear; if of fat they become more evident. *d. Fatty casts*, which exhibit scattered oil-globules, or collections of these, as dark botryoidal masses. *e. Hyaline, transparent, or waxy casts*, varying considerably in diameter, and hence divided by some writers into *large* and *small;* these casts have either a perfectly clear, transparent, and glassy aspect, or present faint markings on the surface, or a dimly molecular appearance. Sometimes a few nuclei or epithelium scales are visible upon them. In some cases they can only be seen after the addition of iodine or magenta solution. *f. Pus casts*, composed of moulded accumulations of pus-corpuscles.

It is in connection with certain forms of Bright's disease that casts are so important, and there are certain conclusions which may be arrived at as a *general rule*, from studying their characters. 1. If they consist chiefly of the blood or epithelial varieties, they indicate an early stage of disease, and the condition of the epithelium may be gathered from the characters of the cells on the casts. 2. Fine hyaline casts are supposed to come from tubules still covered with epithelium, and when they follow the above, show that the disease is subsiding. 3. Large hyaline casts are believed to be formed in tubules deprived of their epithelium, and therefore to indicate grave organic changes in the kidneys. 4. Abundant granular casts also point to advanced disease, and they are frequently mixed with free granules. 5. Fatty casts are very serious, as proving fatty degeneration with destruction of the epithelium.

B. RENAL TUMOR.—A tumor connected with the kidney has the following general characters: 1. It is extra pelvic, occupying mainly either lumbar region, and it cannot be separated from the mass of muscles behind. It, however, increases in a forward direction to a variable degree, sometimes attaining an enormous size and giving rise to general enlargement of the abdomen. 2. The shape is generally more or less that of the kidney, the borders being rounded, but irregularity is not unfrequently observed. 3. As a rule the consistence is firm; occasionally there is a feeling of softness, or even distinct fluctuation. 4. The tumor is almost or quite fixed, not being altered by manipulation or respiratory movements. 5. Percussion reveals dulness, extending back to the spine, with tympanitic note in front, unless the tumor becomes extremely large. 6. In some cases it may be advisable to use an exploratory trocar.

It will be convenient here to allude to certain peculiarities in the position and shape of the kidneys, which may give rise to a difficulty in diagnosis during life. 1. *Movable* or *floating kidney.* Normally the kidneys are nearly fixed, but occasionally one or both, especially the right, are displaced and more or less freely mobile, floating about in the cavity of the abdomen. This has been by far most frequently observed in females, chiefly after repeated or difficult parturition. It has also been attributed to congenital looseness of the attachments, sudden or repeated violent effort, pressure by tight-lacing, rapid absorption of the investing adipose tissue in fat people, increase of weight during the menstrual periods from congestion, with consequent falling-down of the kidneys, and to their being dragged down by hernia. The kidney is felt as a tumor, having the exact form and feel of the healthy organ, and usually lying, when the patient is erect, in an oblique position, directed upwards and outwards, about midway between the margin of the thorax and umbilicus. It is mobile in different directions by change in posture, manipulation, and respiratory movements. In some cases it may be grasped in the hand, this causing a peculiar sickening sensation to the patient. Percussion generally yields a muffled tympanitic sound. On examining the corresponding lumbar region, it will be found flattened or depressed and tympanitic on percussion, owing to the absence of the kidney. In some instances the displaced organ becomes enlarged and painful from time to time, it is supposed from pressure on its own duct leading to retention of urine and inflammation. As a result of repeated attacks of this kind it may become permanently fixed by adhesions. Among the most frequent symptoms of this abnormal condition are uneasiness or dragging pain, increased by walking or standing, neuralgic pains, disturbances of the alimentary canal, and other symptoms due to compression or irritation. Urine is generally normal, but micturition may be frequent or painful. During the inflammatory attacks severe symptoms may be experienced. 2. Now and then the kidney is *fixed* in some abnormal position, this being either congenital or acquired. It is recognized by presenting the characters of the normal organ, though the shape is usually somewhat altered; and by the signs of its being absent from its proper position. 3. *Horseshoe kidney.* Here the two organs are united by an isthmus passing across between their lower ends. This may possibly be felt in very thin persons with loose abdominal walls, and be mistaken for a tumor.

It will be well to point out the characters of a *distended bladder*, as this is liable to occur in medical practice, and it may simulate a tumor or general enlargement of the abdomen. *a.* It occupies mainly the hypogastrium, extending upwards and laterally to a variable extent, and being quite symmetrical. *b.* The shape is conical, the apex being upwards. *c.* Fluctuation is usually perceptible. *d.* There is dulness corresponding to the enlargement in position and shape, while laterally and above tympanitic sound is elicited. *e.* By examination per rectum, the distended bladder may be felt. *f. The use of the catheter* must never be forgotten, or, if this cannot be passed, a small trocar or the aspirateur may be employed above the pubes.

In cases of renal disease, it is of considerable importance to *examine into the state of the heart and vessels* and also to *make use of the ophthalmoscope.*

URÆMIA.

There are certain symptoms grouped under the above term, which are the result of interference with the urinary functions. The conditions under which they arise may be stated generally as: 1. Diseases of the kidneys, especially *Bright's* disease, or nervous and vascular derangements of these organs, which prevent them from doing their excretory work properly. 2. Obstruction of both ureters, so that the urine which is formed cannot escape into the bladder, though it is a remarkable fact that the symptoms are by no means characteristic in these cases. 3. Retention of the urine in the bladder from any cause, when the uræmia is supposed to be partly due to reabsorption of the urinary elements.

The clinical phenomena indicating uræmia are headache, sometimes fixed behind the neck or behind the orbits, or a sense of weight and pressure over the forehead or vertex; increased irritability of the voluntary muscles, evidenced by twitchings and fits of epileptiform convulsions, the face being pale in the latter and the pupils dilated, several fits sometimes occurring in rapid succession, with more or less stupor in the intervals, though consciousness is often partially restored; cerebral disturbance, usually in the direction of drowsiness, heaviness, and confusion of ideas, culminating in stupor or profound coma, delirium being only exceptionally observed; disturbance of vision, in the way of dimness of sight from time to time, or actual temporary blindness, there being no organic changes revealed by the ophthalmoscope; deafness in rare instances; vomiting and diarrhœa, the matters discharged containing a quantity of ammonia, which may be perceptible to the smell; occasionally a urinous or ammoniacal odor of the breath and sweat; and possibly in exceptional cases paroxysms of dyspnœa. The exact combination of symptoms in any individual cases varies considerably, as well as the mode and rapidity of their onset. As a rule they come on gradually, beginning with headache and vomiting. Occasionally they commence with a perfectly sudden apoplectiform or epileptiform attack, or with blindness, or severe vomiting.

Certain cases of uræmia are particularly liable to be mistaken for apoplexy, epilepsy, or opium-poisoning. The diagnostic points will be considered in a future chapter; at present I would only draw attention to the great importance of *testing the urine in all cases of sudden insensibility.* Cases of belladonna-poisoning may also simulate uræmia. The possibility of headache, disturbances of sight or hearing, and vomiting or diarrhœa, being due to this cause, must not be forgotten.

PATHOLOGY.—Most authorities regard the phenomena of uræmia as due to the accumulation in the blood of some poisonous materials, the circulation of which through the nervous and muscular systems produces the effects described. Formerly, they were attributed to non-excretion of urea, or to carbonate of ammonia resulting from the decomposition of this, but more recent observations seem to indicate that the chief poisonous agents are substances produced by imperfect tissue-metamorphosis, which in the normal state of things should be further converted into urea and uric acid and excreted. The watery state of the blood, and œdema with anæmia of the brain-substance, have also been made to account for the phenomena of uræmia.

TREATMENT.—In the uræmic state the main indications are to remove any cause of obstruction; to use measures for promoting excretion of urine, especially free dry-cupping or heat and moisture over the loins; to encourage the action of the skin by warm, vapor, or hot-air baths; and to treat symptoms. Inhalation of chloroform is useful for the epileptiform attacks. Venesection is often employed for apoplectic seizures, but it is not admissible if there is advanced chronic disease of the kidneys. Sinapisms to the back of the neck and limbs may be used. Vomiting must be treated in the usual way, but it is not advisable to check diarrhœa too speedily.

CHAPTER L.

DIABETES MELLITUS—GLYCOSURIA.

Etiology and Pathology.—A small quantity of sugar is frequently found in the urine temporarily under certain circumstances, especially after taking food containing much sugar or starch, after the administration of chloroform, in poisoning by strychnine or woorara, in various conditions which interfere with respiration, such as fits of asthma and hooping-cough, and in some nervous diseases (epilepsy, tetanus, apoplexy, &c.), or from injuries to the nervous system, liver, &c. Glycosuria can also be produced experimentally in several ways. In the disease now under consideration, however, this state of the urine is permanent, the sugar being generally in large proportion, and in most cases this is accompanied with serious constitutional disorder. Many views have been advanced to explain the pathology of diabetes, but there can be no doubt that the true one is that which attributes it to some derangement in connection with the so-called glycogenic functions of the liver, though what the exact deviation is, is by no means a settled point. It seems quite certain that in health an amyloid, fermentable substance, capable of conversion into grape-sugar, and named *glycogen, animal or hepatic dextrin or starch,* is formed in the liver. It is also proved that a peculiar ferment exists in the blood capable of converting this into sugar. One class of physiologists believe that in the normal state this conversion takes place *in the liver constantly,* the sugar passing on into the circulation through the hepatic vein, being gradually oxidized and destroyed in the blood. Another class deny that there is any such change in health, and Dr. McDonnell has advanced the theory that the hepatic dextrin is not converted into sugar at all, but unites with nitrogen to form a new protein compound resembling casein. Those who hold the first view believe that diabetes consists either in an *increased formation of sugar* in the liver, or in a *diminished destruction* of that normally produced; hence it accumulates in the blood and is excreted by the kidneys. The second class of pathologists are of opinion that, under certain conditions, the ferment reacts upon the dextrin in the liver, which leads to an unnatural production of sugar.

Whichever theory may be right, it further appears tolerably certain, from experiment as well as clinical and post-mortem examination, that the immediate cause of the deviation is to be found in a morbid condition of certain portions of the nervous system. By irritating or injuring the portion of the sympathetic which sends branches to the liver, certain parts of the spinal cord, or the floor of the fourth ventricle, glycosuria may be induced. It is supposed that this nervous disturbance acts through the vessels of the liver, inducing paralysis of their circular muscular fibres, with consequent passive dilatation and congestion, so that the ferment and amyloid matter come into close contract. Others believe that the nerves directly affect the amount of glycogen formed and the rapidity of its conversion into sugar.

The *exciting causes* of diabetes are in many instances by no means clear. Among those to which it has been mainly attributed are exposure to wet and cold; drinking cold water when heated; abuse of alcohol, sugar, and starchy substances; strong emotional disturbance or excessive mental work; injuries to the head, spine, and various other parts, or general concussion of the body; organic diseases of the brain and spinal cord. In some cases the disease seems to follow prolonged depressing mental causes, combined with influences which tend to impair the health, as, for instance, grief and anxiety with long watching over the sick, or worry and close confinement in business. Occasionally it has appeared to be the sequela of some acute febrile disease. Diabetes is most common in adults (from 25 to 65), being specially met with during the period of development and exercise of the sexual functions; in males, after the period of puberty; and in those residing in cities and manufacturing districts. In some instances there appears to be some hereditary influence, or the disease tends to run in families.

ANATOMICAL CHARACTERS.—There are no morbid appearances peculiar to diabetes, so far as is at present known, but the most important lesions observed, which seem to bear a causal relation, are those associated with the nervous system. In some cases there is obvious organic disease, such as a tumor affecting the medulla or pons, or pressing on the sympathetic. In others close examination, aided by the microscope, is necessary to defect the changes. Dr. Dickinson has described peculiar alterations in various parts of the nerve-centres, especially about the medulla and pons, in the way of dilatation of the arteries, followed by degeneration and destruction of the nerve-elements around them, leading to the formation of excavations, which may be of some size. Most authorities deny that there is any special morbid condition of the liver, though some observers have described certain peculiar changes in its general or microscopic characters. The kidneys are often diseased, but this is a secondary result of the diabetes, the most frequent morbid state being some form of Bright's disease. The lungs are also frequently affected, there being usually some form of phthisis, occasionally pneumonia of a low type, or gangrene. The heart is generally small and wanting in tone. There is a tendency to low serous inflammations, or to inflammation of other structures ending in suppuration or gangrene. Hypertrophy of the pancreas is said to be comparatively frequent. The stomach is generally dilated, its mucous coat thickened and softened, and its muscular coat sometimes hypertrophied.

SYMPTOMS.—Clinically, cases of diabetes differ remarkably in their severity, one class presenting but slight symptoms, the other being accompanied with marked local and constitutional disturbance. In a typical instance the symptoms may be arranged thus:

1. *Those referable to the Urinary Organs and Urine.*—Micturition becomes more and more frequent, and the urine increased in quantity. It is irritating in quality, and hence often causes a sense of heat or burning along the urethra in the male, or slight inflammation, excoriation, or even ulceration about the orifice; while, in the female, the vulva is frequently much irritated. Pain and tenderness are frequently complained of over the region of the kidneys. The characters of the urine, in addition to its being in excess, amounting often to 8, 12, 20, or even 30 pints in the 24

hours, are, that it is usually very pale and bright, the more so in proportion to the quantity; possesses a sweet taste, and occasionally a sweetish odor; has a high specific gravity, generally about 1040, but it may range from 1015 to 1060 or more; ferments rapidly if kept in a warm place, with formation of torulæ, becoming opalescent or forming a deposit; and that it yields more or less sugar. Many different statements have been made as to the proportion of urea and uric acid present; probably they are, as a rule, absolutely increased, but relatively to the water diminished. The quantity of water is about equal to that drunk. The amount of sugar is greater after food, especially such as contains much sugar or starch, being much less when only animal food is taken. In any pyrexial condition it becomes greatly diminished, or may even be absent altogether. The proportion usually present is from 8 to 12 per cent., and from 15 to 25 ounces are discharged daily on the average; but the quantity may vary from less than an ounce to two pounds or more. The urine may contain albumen and occasionally a little blood; it is also stated sometimes to yield fat, or to present an appearance like chylous urine.

2. *Symptoms referable to the Digestive Organs.*—The most constant of these is insatiable *thirst*, attended with a dry, parched, and clammy condition of the mouth and throat, due to the presence of sugar in the blood, which creates a demand for much liquid. In many cases also there is *excessive appetite*, but disinclination for food is not uncommonly observed. The *tongue* generally presents a peculiar irritable, red, clean, cracked and dry appearance; it may be moist and furred. Sponginess of the gums with tendency to bleed, and rapid destruction of the teeth are frequently noticed. The saliva contains sugar, and it is said to be very acid sometimes, owing to the conversion of this into lactic acid. The breath has, in some cases, a distinctly sweet or ale-like odor. Dyspeptic symptoms are common, such as epigastric fulness or sinking, flatulence, gaseous and acid eructations. As a rule the bowels are constipated, with pale, dry, and spongy fæces, but there may be diarrhœa or dysenteric symptoms, especially towards the close.

3. *General Symptoms.*—The aspect of the patient is, in many instances, strikingly suggestive of diabetes, the prominent charac-

ters being emaciation, often extreme, involving the muscles as well as the fat, which feel flabby and soft; a peculiar dry, harsh, scurfy condition of the skin; and a distressed, worn, and suffering expression of countenance. The patient feels very weak and languid, often chilly, indisposed for any bodily or mental effort, and complains of pain and soreness in the limbs. Some œdema of the legs is frequently observed, and occasionally dropsy in other parts. Sometimes the temperature is markedly reduced, and if fever occurs it is not nearly so much elevated as it otherwise would be. Sexual inclination and power are commonly greatly diminished or lost. The mental condition and disposition become usually much altered in established cases, as evidenced by decline of mental vigor, disposition to lassitude or drowsiness, lowness of spirits, petulance and irritability, or decline in firmness of character and moral tone. Temporary dimness of vision is not infrequent. The blood contains sugar, which is also found in the various secretions.

4. *Symptoms due to Complications.*—Most of the complications of diabetes have been already alluded to in the account of the morbid anatomy, the most frequent symptoms coming under this head being those indicating phthisis. Here may also be mentioned the not uncommon occurrence of boils and carbuncles, chronic skin affections (psoriasis, &c.), gradual permanent blindness from atrophy of the retina, and *cataract*, the last being almost always of the soft kind. It has been supposed to be due to imbibition of sugar, which, it is said, has been detected in it.

The precise clinical history of diabetes necessarily varies much in different cases, as to the intensity and exact combination of the symptoms described, and the rapidity of the progress. As a rule the course is essentially chronic, the symptoms setting in very insidiously, and becoming progressively worse. Occasionally the disease runs an acute course, and it may remit from time to time. It is frequently observed that the symptoms are more intense in the early period of a case than subsequently. Towards the close they often change, the urine diminishing in quantity, as well as the sugar, albuminuria setting in, there being complete disgust for food, and hectic or colliquative diarrhœa occurring. The fatal result may arise from gradual exhaustion, sometimes culminating at the close in stupor ending in complete coma, or occasionally in convulsions. Now and then death is quite sudden. As a rule it is much hastened by complications.

DIAGNOSIS.—When diabetes is well established, there is no difficulty in detecting it. The rule of *always examining the urine carefully* when the health is persistently out of order, and especially if there are the slightest symptoms suggestive of this disease, will often lead to a diagnosis at an early period. The mere finding of a trace of sugar in the urine is not, however, evidence of the existence of diabetes. It must be in some quantity, persistent, and attended with polyuria. It is not often that there is any possibility of finding out the exact morbid condition on which the diabetes depends.

PROGNOSIS.—Confirmed diabetes is a very serious disease, a large proportion of the cases ending fatally, and the average duration is stated to be about from one to three years. In many, however, much improvement may be effected, and in some recovery can be brought about. The chief circumstances which influence the prognosis are age, it being worse in very young than old persons; the general condition of the patient, the disease being much less serious in stout persons; the cause of the complaint and its duration; the amount of sugar and urine passed; the severity of the general symptoms; the presence or absence of complications, as well as their nature; and the progress of the case, especially noting the results of proper treatment. Any person suffering from diabetes should be particularly careful against exposure and other causes of disease.

TREATMENT.—1. The first principle almost universally recognized in the treatment of diabetes is *regulation of the diet.* The object is to prohibit all articles which contain sugar or starch. The chief substances to be withdrawn are ordinary bread or flour; sugar in any form; honey; vegetables and fruits containing starch or sugar (potatoes, peas, beans, carrots, turnips, parsnips, strawberries, raspberries, plums, gooseberries, currants, apples, pears, &c.); rice; prepared varieties of starch (sago, maccaroni, tapioca, &c.); shell-fish, and the soft parts of crabs and lobsters. Animal food, including meat, poultry, game and fish, should be the main diet, with the exception of liver. The chief substitutes for bread are bran-cake or biscuits, gluten bread, almond rusks and biscuits, or thin slices of bread toasted until they are almost black; eggs, butter, cheese, broths, soups, and jellies are admissible; also vegetables not containing sugar or starch, viz., cabbage, Brussels sprouts, broccoli, cauliflower, lettuce, cress, mustard, celery, &c.

The question of drink is also of much moment, and first with regard to *milk*. Theoretically this is contraindicated, because it contains much sugar, but it has been found in some instances that when given in moderate quantities it is not injurious, and may even be beneficial. Therefore it is allowable to try the effects of a regulated amount in any individual case, and be guided accordingly. Cream may be given in abundance. Dr. Donkin has advocated the treatment of diabetes entirely by *skimmed milk*, given in quantities of six or eight pints daily, and continued for several weeks if necessary, no other food or medicine being allowed. At present most authorities on diabetes are not favorable to this treatment, and judging from the results in two cases which have come under my own care, I do not feel much disposed to try it again. With regard to alcoholic stimulants, the balance of evidence is decidedly against permitting them to any extent. A small amount is frequently serviceable, those forms of stimulant being used which are most free from sugar, viz., dry sherry, bitter ale, brandy, whisky, and claret. Tea and coffee may be taken without sugar. It is not desirable to restrict the quantity of drink too much, but it must be moderated so far as the feelings of the patient will permit. Thirst may be relieved by water, acid drinks, of which a solution of phosphoric acid has been much recommended, or solution of cream of tartar. Prout affirmed that tepid liquids give more relief than cold. The Bristol Hotwells, Carlsbad and Vichy waters, are said to have an influence on the disease, as well as being useful as a drink.

It is highly important to attend to certain matters in regulating the diet. 1. The change should be gradual and not sudden. 2. Frequent alterations should be made in the food, amongst those articles which are permissible. 3. In many cases it is necessary to watch carefully that the regimen laid down is strictly attended to, especially at the early period of treatment, and among ignorant patients. 4. Every individual case must be studied for itself, and the advisability of persevering in the restricted diet or not judged by the results. In some instances, where there is much loathing of the food, a little bread is often of great benefit. Again, if a fair trial of the recognized diet seems to produce no improvement, or if the general condition is getting worse, as may happen especially when the disease is very advanced, it may be desirable to let the patient follow his own inclination, guided by intelligence; sometimes also patients cannot possibly take the prescribed food, and then a mixed diet must be given.

Allusion may be here made to the *saccharine treatment* of diabetes, in which sugar and honey are administered in considerable quantities and any diet allowed. This has been proved to be decidedly injurious in the majority of cases.

2. *General hygienic management* is very beneficial. The patient should be completely clad in flannel, and have two or three warm baths every week. Change of air, especially to the seaside, with sea-bathing, is useful in some cases.

3. Numerous medicines have been brought forward, supposed to have a direct curative influence upon diabetes, especially in diminishing the quantity of urine and sugar. The principal of these include opium, given in increasing doses, up to 6 to 20 grains a day, which certainly is useful in some cases; alkaline bicarbonates, pepsin, rennet, arsenic, iodine, bromide of potassium, and peroxide of hydrogen. The evidence in favor of the value of most of these is very slight.

4. *Symptomatic treatment* often calls for attention in diabetes, especially directed to the digestive organs, the general condition and state of the blood, nervous disturbance in the way of sleeplessness and restlessness, and the various complications. These must be managed on ordinary principles.

DIABETES INSIPIDUS.

This affection is characterized by great thirst, with an increased flow of urine, watery and of low specific gravity, but not containing any sugar or other abnormal ingredient. The proportion of solids discharged in the 24 hours may be normal, excessive, or deficient. Frequent micturition is often observed.

Occasionally the patient enjoys excellent health, but more commonly there are more or less of the symptoms noticed in diabetes mellitus, especially a dry and harsh skin, loss of flesh and weakness, and dryness of the mouth. In most cases the appetite is not excessive, but sometimes it is voracious. As a rule the complaint is chronic in its onset and course; occasionally it sets in suddenly. Recovery is extremely exceptional, but death usually results from some organic complication.

The *etiology* is very obscure. The probable immediate cause is dilatation of the renal vessels from paralysis of the muscular coat, resulting from deranged innervation. The condition can be induced by irritating a certain spot in the floor of the fourth ventricle. It has also been attributed to injury to the nervous centres or sympathetic, organic diseases of the brain and cord, depressing emotions, hysteria, neuralgia, &c. Among other alleged causes are exposure to cold, drinking cold water when heated, violent effort, previous febrile and inflammatory attacks.

The chief remedies advocated in *treatment* are opium, valerian, camphor, nitrate of potash, iron, iodide of potassium. Withdrawal of liquids has not been successful. The constant galvanic current over the hypochondrium has been recommended.

CHAPTER LI.

RENAL CONGESTION OR HYPERÆMIA.

ETIOLOGY.—Congestion of the kidneys may be *active* or *mechanical.* The former, also named *catarrhal nephritis,* results from: 1. Any pyrexial condition, but especially that accompanying the exanthemata. 2. Cold and wet. 3. Certain irritant medicines when used in excess (cantharides, turpentine, nitre, cubebs, copaiba, &c.). 4. The irritating state of the urine in diabetes. 5. Morbid formations in the kidney, and the early stage of inflammation. 6. It is said hypertrophy of the left ventricle, or possibly active dilatation of the vessels. *Mechanical hyperæmia* is a common consequence of: 1. Some cardiac or pulmonary disease interfering with the general venous circulation. 2. Pressure upon one or both renal veins, or upon the inferior vena cava above them, by tumors, &c., especially a pregnant uterus.

ANATOMICAL CHARACTERS.—At first the kidneys present the characters ordinarily accompanying congestion, viz., enlargement and increase in weight, increased redness with points of vascularity especially corresponding to the Malpighian bodies, and sometimes minute ecchymoses. In many forms of active hyperæmia there is a catarrhal state of the ducts of the pyramids, with shedding of epithelium. After the mechanical form has lasted some time, the usual serious changes resulting from this are set up, leading to grave disorganization of the kidneys, which become contracted, indurated, sometimes granular or irregular, with ultimately more or less atrophy of the cortical substance. Microscopical examination reveals alteration in shape of the tubes, with thickening of their walls; changes in the epithelium, which is often destroyed; increase in the intertubular connective tissue; and permanent distension of the minute vessels. By some authorities this condition is looked upon as a form of Bright's disease.

SYMPTOMS.—Congestion of the kidneys is indicated, as a rule, by the urine becoming diminished in quantity, high-colored, concentrated, depositing urates abundantly on standing, and afterwards containing some albumen, occasionally a little blood or clear fibrinous casts, and a few renal epithelium cells. In some forms of active hyperæmia, however, there is a copious flow of watery urine, pale, and of low specific gravity. There may be a sense of fulness about the loins, or even some pain, and tenderness is frequently complained of. If the congestion subsides, the urine assumes its normal characters, but if it continues and leads to organic changes in the kidneys, this fluid presents more marked and permanent changes, to be hereafter considered.

TREATMENT.—If renal congestion calls for any interference, the main point is to remove or mitigate its cause as soon as possible, especially in the mechanical form. Rest in the recumbent posture, free dry cupping or heat and moisture over the loins, or sometimes the removal of a little blood, the warm-bath, and active purgation, are the chief direct remedies to be employed.

RENAL EMBOLISM—INFARCTION.

Emboli not unfrequently lodge in the kidneys and give rise to infarctions, almost invariably confined to the cortical portion, differing in size, usually well-defined and wedge-shaped, with the base towards the surface. At first they are dark-red, but become decolorized from the centre towards the circumference, leaving yellow masses, which may be ultimately absorbed, depressed cicatrices alone remaining. Rarely an infarction softens and breaks down, forming a pseudo-abscess, or, it is said, even actual pus may be produced. As a rule there are no *symptoms*. If the embolus is large, it may cause a sudden severe pain in the renal region, shooting towards the pelvis, with albuminuria or hæmaturia. Should an abscess form, there might be symptoms indicating this event.

SUPPURATIVE INFLAMMATION OF THE KIDNEY—SUPPURATIVE NEPHRITIS—RENAL ABSCESS.

ETIOLOGY.—The causes of renal inflammation ending in suppuration are: 1. Injury from without. 2. Some direct irritation in the substance of the kidney, especially from a calculus. 3. Suppuration in the urinary passages, that in the kidney being set up either by extension, or independently, the latter probably being the result of a kind of local pyæmia. 4. Embolism. 5. General pyæmia. 6. Extension of inflammation from surrounding structures.

ANATOMICAL CHARACTERS.—Whatever may be the origin of the inflammation, the alterations in the kidney are in most cases similar at first, viz., enlargement, hyperæmia, much blood flowing on section, and diminution in consistence. It is supposed that an interstitial exudation then forms. Suppuration usually commences in separate points, which extend and coalesce to form one or more abscesses, these varying much in size. In most forms of the disease only one kidney is involved as a rule, and there is finally but a single abscess, which may attain large dimensions, and open into the pelvis of the kidney, externally in the loins, into the peritoneum or subperitoneal tissue around, intestines, or thorax. Occasionally inspissation of the contents takes place followed by caseation and calcification, a cure being thus effected. In pyæmia there are numerous scattered abscesses of small size. It is said that pus is sometimes infiltrated through the kidneys; also that it forms within the tubules.

SYMPTOMS.—Acute suppurative nephritis is generally accompanied with local pain, often severe, increased by movement, frequently shooting towards the bladder, testis, or thigh, with tenderness. The testis may be drawn up. The urine is diminished in quantity and concentrated, or even actually suppressed, frequently containing some blood, or merely a little albumen, but these may be quite absent. As a rule there are distinct rigors, followed by marked pyrexia, which has a great tendency to assume a typhoid type, especially when suppuration occurs, this being accompanied with repeated shiverings. Sympathetic vomiting is not uncommon. Uræmic symptoms are also liable to arise. Should a large abscess form, it presents as an elastic or fluctuating fulness or tumor, usually in the lumbar region, where it may afterwards burst. If it opens into the pelvis of the kidney, a copious discharge of pus takes place by the urine, and this may afterwards continue persistently or at intervals. Various symptoms result from the bursting of an abscess into other parts. When the kidneys are involved in pyæmia, there are no prominent local signs; and the same is often the case when the renal disease follows some morbid condition of the urinary passages, when it is frequently somewhat chronic.

PYELITIS—INFLAMMATION OF THE PELVIS OF THE KIDNEY—PYONEPHROSIS.

ETIOLOGY.—The affection now under consideration is quite distinct from that just described, the inflammation involving the mucous membrane lining the pelvis and infundibula. Its important causes are: 1. Direct irritation by some foreign matters lodged there, especially a calculus or gravel, parasites, and blood-clots. 2. Morbid deposits (cancer, tubercle). 3. Extension of inflammation from the bladder along the ureter. 4. Irritation by accumulated urine, resulting from closure of the ureter by pressure or internal obstruction, especially if this has become decomposed. In rare instances pyelitis seems to come on idiopathically, from exposure to cold and wet, or other influences. A certain degree of it may also arise in the course of various febrile affections, in organic affections of the kidneys, diabetes, and from the use of certain drugs (turpentine, cantharides, &c.).

ANATOMICAL CHARACTERS.—Pyelitis may be *acute* or *chronic*, and the appearances vary accordingly. In the acute form, which is usually *catarrhal*, there is injection of the membrane, occasionally with slight ecchymoses or extravasation of blood, relaxation and softening, with shedding of epithelium, and subsequently discharge of a purulent mucus or actual pus. Occasionally *diphtheritic* or *croupous* inflammation is observed, along with a similar condition of other mucous surfaces. The chronic variety may either follow the acute or commence as such. The membrane is then pale, though some veins may be permanently distended, often gray or slate-colored from pigment, much thickened and firm. Pus is constantly formed, and if there is no obstruction it flows away with the urine; should there be an impediment to its escape it accumulates in the pelvis, which it distends more and more, giving rise to the condition named *pyonephrosis;* here it is frequently mixed with ,other materials, such as urine, which is usually decomposed and ammoniacal, deposits from this (uric acid and urates if it is acid, phosphates if alkaline, these sometimes forming incrustations), calculi or other materials which may have caused the pyelitis, or blood. By degrees the substance of the kidney is compressed and invaded upon, until ultimately it may be completely destroyed, a mere sac remaining containing pus, &c. In other instances distinct disease is set up in different parts of the kidney (pyonephrosis), or it may simply shrivel up and atrophy. The accumulation may burst in any of the directions which renal abscess takes, or occasionally ulceration of the mucous membrane is excited by some foreign body, and perforation occurs before any particular distension is produced. In some cases the pus becomes inspissated, and abundant calcareous deposits are formed, or even imperfect bone, the cavity contracting and shrivelling up.

SYMPTOMS.—In the majority of cases pyelitis is preceded or accompanied by symptoms due to its cause, *e. g.*, those of calculus or disease of the bladder. The *local* clinical phenomena associated with this complaint are uneasiness or pain over one or both lumbar regions, often of an aching character or shooting downwards, with tenderness and a sense of weakness; generally frequent micturition; changes in the urine; and in some instances the presence of a tumor. The alterations in the urine may be the only deviation from health. It is often increased in quantity, as a rule *acid,* and at first contains a little blood intimately mixed with mucus and the variously shaped epithelium-cells from the pelvis and infundibula; gradually it becomes mixed more and more with pus, until finally this may be present in large quantity, and it comes away persistently so long as there is no obstruction to its escape. Albumen is only observed in proportion to the amount of blood and pus. Some important differences are noticed in the characters of the urine under certain circumstances. If the flow of pus along the ureter is impeded in any way, as by a calculus, the urine may become quite natural, provided only one kidney is involved; if both are implicated, or if the closure of the ureter is incomplete, the quantity of pus is merely lessened. Should the obstruction be removed, a copious flow of purulent urine again occurs; this may be repeated from time to time, or the obstruction may remain permanently. Further, if the urine is retained it tends to decompose, and is then frequently discharged in an ammoniacal state. Should accumulation of materials in the pelvis occur, a fulness or *tumor* is formed, having the general characters of renal enlargement, with an elastic or fluctuating feel. This will be subject to increase in size should there be obstruction in the ureter from time to time, becoming then also more painful and tender, and it may suddenly subside as the impediment is removed. Occasionally it attains very large dimensions.

The *general symptoms* are those of pyrexia in the acute form, preceded by rigors. When suppuration occurs there are commonly repeated rigors, in some cases recurring at regular intervals, and in prolonged cases signs of hectic. The bowels are often disturbed, there being either diarrhœa or obstinate constipation, the latter due to pressure on the colon. If the kidneys become independently implicated, symptoms of Bright's disease set in. In some cases recovery takes place, provided only one kidney is affected and the cause of the complaint can be removed, though it is often with complete destruction of the involved organ. Most commonly, however, death ultimately happens from gradual exhaustion. This may result also from perforation or rupture of the distended pelvis, the symptoms differing according to the direction in which this occurs.

PERINEPHRITIS.

The form of inflammation may be alluded to here, in which the tissue surrounding the kidney is implicated, usually suppuration occurring as the final result. It is caused by injury, cold, or previous suppurative nephritis or pyelitis. Clinically it presents a history very much like that of the diseases just mentioned, but is distinguished, if uncomplicated, by the absence of any disturbance of the renal functions, or of any changes in the urine. Perhaps the greater intensity and superficialness of the pain and tenderness, with their more marked exacerbation by movement, and œdema of the skin, may help. The abscess generally opens behind, but may rupture in various other directions.

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CHAPTER LII.

BRIGHT'S DISEASE.

NUMEROUS and diverse have been the arrangements by different authors of the morbid conditions included within the term "Bright's disease." In general language it is employed to signify any structural disease of the kidneys which leads to albuminuria and dropsy. Primarily it is divided into *acute* and *chronic* forms.

ACUTE BRIGHT'S DISEASE—ACUTE DESQUAMATIVE NEPHRITIS —ACUTE TUBAL NEPHRITIS.

ETIOLOGY.—In the large majority of cases acute Bright's disease is a *sequela of scarlatina*, or results from *taking cold.* It may follow excessive drinking, or be set up occasionally in the course of other exanthemata besides scarlet fever (measles, typhus, &c.), in the collapse stage of cholera, it is said after ague or exposure to malaria, or during pregnancy. There is good reason for believing that the pathological cause in many of these conditions is, that the functions of the kidneys are abnormally exercised, these organs having to excrete materials either formed in excess, or of an unusual character, or such as ought to be removed by the skin. The chief *predisposing causes* are the early period of life, want of cleanliness of the skin, intemperate habits, and occupations which involve exposure. In some cases probably Bright's disease has existed in a chronic form without giving rise to any evident symptoms, until one of the above causes makes it assume an acute character.

ANATOMICAL CHARACTERS.—The kidneys are enlarged and increased in weight, as a rule considerably. At first they are deeply congested, the surface and a section presenting a deep dusky-red color, with darker spots corresponding to the Malpighian corpuscles or to minute hemorrhages, while the superficial veins are distended, and a quantity of bloody fluid escapes on section. The surface is quite smooth, and the capsule easily separated. The enlargement is mainly due to increase in the cortical substance, which is found to be much thickened, softened, lacerable, and friable. The pelvis and infundibula are also injected, and a bloody liquid is often found here. In a more advanced stage the color of the cortical portion changes, becoming either more or less white, yellowish-white, or pale buff, opaque, and dotted, or presenting a mottled surface of red and white, while the pyramids remain dark-red and striated, red lines radiating in a fan-like manner from their bases.

Microscopic examination reveals capillary distension, fibrinous exudation within the tubules of the kidney, as well as red blood-corpuscles, and extremely abundant epithelium-cells, which become detached, rapidly increase in number, and accumulate in the tubules, many of these being crammed full of cells, and some dilated. Most of the epithelium particles are altered, being enlarged, cloudy or opaque, more or less granular from the presence of protein granules or sometimes of fat, or quite disintegrated, there being also abundant young cells resulting from proliferation. They accumulate more and more as the disease advances, and hence the pale color, this partly resulting also from compression of the vessels. In some tubules the epithelium may be completely detached, only hyaline fibrinous moulds remaining. These changes are much more evident in the cortical than the pyramidal portion of the kidneys.

In fatal cases morbid appearances due to complications are commonly observed, especially serous inflammations, endocarditis, pneumonia, or bronchitis. Dropsy and its consequences are generally present.

PATHOLOGY.—Acute Bright's disease is essentially an intense *catarrhal inflammation of the tubules of the kidney.* As a result, in addition to capillary engorgement and rupture, the epithelial cells undergo rapid proliferation. The renal functions are greatly impeded, hence the blood becomes overloaded with excrementitious matters—urea, uric acid, &c., as well as watery and very deficient in albumen and red corpuscles. The elements formed in the kidneys are washed away by the urine, in which they are visible on microscopic examination.

SYMPTOMS.—As a rule the onset of acute Bright's disease is definite and rapid; frequently it sets in with chilliness or rigors, general pains, headache, often nausea or severe vomiting; in other cases dropsy rapidly extending is the first symptom; and occasionally uræmic phenomena first occur. When the disease is established, the characteristic clinical signs include peculiar changes in the urine; more or less general anasarca, frequently with effusion into serous cavities or œdema of organs; extreme pallor, puffiness and dryness of the skin; a tendency to uræmia, serous inflammations, endocarditis, pneumonia, or bronchitis; and pyrexia. Generally there is some dull pain, with tenderness over the renal regions, but these sensations are not prominent; micturition also is in most cases too frequent, especially at night, though the quantity of urine passed is greatly diminished, and sometimes it is almost or quite suppressed. What is discharged has the following characters: it is dark in color, from excess of pigment and blood, the latter often causing it to assume a smoky-brown or dark-red tint: the specific gravity is high, 1025—1030—1040 or more; the reaction is almost always acid; the normal odor is replaced by one compared to that of beef tea, or the washings of flesh or whey; an abundant sediment forms, brown and flocculent, and urates are frequently deposited. Chemical examination reveals abundance of albumen, the urine sometimes becoming almost solid on boiling. The excretion of urea and inorganic salts is greatly diminished, but uric acid is about normal. Under the microscope the deposit is seen to consist of red blood-corpuscles, in some cases much altered in appearance; renal epithelium-cells, usually more or less swollen, cloudy or granular, or partially disintegrated; remnants of these in the form of nuclei or granular matter; extra-renal epithelium; amorphous particles of fibrin; and numerous casts, chiefly of the "blood" and "epithelial" varieties at first, and of medium size, with a few large or small "hyaline," and some opaque "granular" casts. The casts change during the progress of a case, and it is very important to study the alterations; not uncommonly a little fat appears in connection with these and the epithelium, which disappears as the disease subsides.

Dropsy often comes on with great rapidity, in some cases rendering a patient irrecognizable in a few hours, while the face has a very characteristic blanched, pasty, and puffy aspect. Hydrothorax, ascites, and œdema of the lungs are common, and œdema glottidis sometimes proves highly dangerous. The patient generally feels dull and heavy, or complains of headache, and distinct uræmic symptoms are liable to arise at any time. Inflammatory complications will be indicated by their special signs, those chiefly to be borne in mind being pericarditis, pleurisy, endocarditis, peritonitis, bronchitis, and pneumonia. Fever is often high, with a full and hard pulse, while there is complete loss of appetite, great thirst, and usually constipation. The blood is hyperinotic.

The progress, duration, and termination of acute Bright's disease vary considerably. Recovery may follow speedily or gradually. Complete improvement is indicated by the disappearance of the dropsy, subsidence of pyrexia, and restoration of the action of the skin, and by the urine becoming abundant, clear, of low specific gravity, while blood, albumen, and casts disappear, many of the latter being "hyaline" during the progress towards convalescence. Some fatty changes may be noticed, but they disappear in a favorable case. As a rule the dropsy disappears before the albuminuria, and the latter may hold on for a considerable time. Not uncommonly acute Bright's disease passes into a chronic form. Death may result from dropsy affecting important parts, such as the glottis; inflammatory complications; or uræmia.

CHRONIC BRIGHT'S DISEASE.

There are certain well-marked varieties of this complaint recognized by most authors. The subject will, perhaps, be presented most clearly by first pointing out the general causes and clinical features of the disease, and then considering the main facts pertaining to each special type.

GENERAL ETIOLOGY.—The chief causes of chronic Bright's disease are: 1. A previous acute attack. 2. Constant or frequent exposure to cold, wet, or sudden changes of temperature. 3. Abuse of alcohol, particularly of ardent spirits. Dr. Dickinson has, however, attempted to prove that this cause has been greatly exaggerated. 4. Some *constitutional diathesis* or *blood poisoning*, especially gout, syphilis, tubercular or scrofulous disease, chronic saturnism, and the fatty diathesis. The opinion is held by some pathologists that all forms of Bright's disease are of constitutional origin, the renal affection being but a local development of a general disorder. 5. Chronic disease of the pelvis of the kidney, bladder, urethra, or prostate gland. 6. Pregnancy.

With regard to *predisposing causes*, it is found that chronic Bright's disease is more prevalent among males, probably from their more frequent exposure to the exciting causes; in adults; in those whose occupation involves exposure to cold and wet or sudden changes (cabmen, laborers, puddlers, workers in glass, &c.), or greater temptations to intemperance; and among the poor. Want of cleanliness of the skin is a powerful predisposing cause, and this is often combined with exposure and intemperance, the three together being peculiarly prone to give rise to Bright's disease.

GENERAL CLINICAL HISTORY.—In general terms the symptoms of chronic Bright's disease include changes in the urine, especially albuminuria, the presence of casts and renal epithelium, or sometimes of blood, and diminution in the quantity of urea and other urinary ingredients excreted ; frequent micturition, especially nocturnal; dropsical accumulations, liable to come and go, or to alter their seat rapidly; deficient action of the skin, which is almost always dry, and often rough and harsh ; changes in the blood, which becomes hydræmic and deficient in albumen and red corpuscles, with consequent pallor or sallowness of the skin, shortness of breath, &c., while excretory elements collect in it. Sometimes there is uneasiness or tenderness over the region of the kidneys. Headache and giddiness are frequently complained of, and serious uræmic symptoms are liable to arise at any moment. Serous inflammations, endocarditis, bronchitis, and pneumonia are also to be feared. Derangements of the digestive organs are very common, in the way of loss of appetite, dyspeptic symptoms, nausea or vomiting, flatulence, and irregularities of the bowels. Other complications often met with are phthisis, cardiac disease, morbid conditions of the vessels, and hepatic disease. In certain cases apoplexy is frequent.

As regards the mode of onset, chronic Bright's disease not uncommonly remains after an acute attack; in most cases, however, it sets in gradually, and there may be nothing to draw attention to its existence, until some grave uræmic or other symptoms reveal the serious condition present. In other instances there may only be albuminuria or slight dropsy. The disease is generally subject to remissions and subacute or acute exacerbations, the latter often coming on from a slight or even without any obvious cause. The duration is very variable, some cases lasting many years, and it differs in the several forms. Death is usually hastened at the close by uræmia, serous inflammations, pneumonia, bronchitis, dropsy, either on account of its dangerous situation or from its exciting erysipelas or gangrene, or apoplexy. A few cases terminate gradually by asthenia; in others, death results from independent complications, such as phthisis. Recovery may ensue even after the disease has lasted a considerable time.

It is requisite to draw special attention to certain changes in the eye. The occurrence of temporary attacks of disturbance of vision, in connection with uræmia, has already been alluded to. There is, however, another form of amaurosis, which is met with in Bright's disease, attended with definite morbid changes in the retina, as observed with the ophthalmoscope, viz., *albuminuric retinitis and hemorrhages.* The loss of sight, then, as a rule, creeps on slowly and is permanent, though it is liable to sudden increase from various causes, with subsequent improvement. For a full account of the ophthalmoscopic appearances and minute changes in the tissues of the eye, reference must be made to Dr. Clifford Allbutt's and other works, which treat of the ophthalmoscope. At first, the appearances observed are increased vascularity, with enlargement and tortuosity of the retinal veins, while the arteries shrink; and slight swelling around the disk, the margin of which becomes indistinct, while it itself becomes suffused and dark-red, a gray filmy exudation afterwards forming. The most characteristic appearances, however, which are noticed later on, are those due to the presence of numerous *whitish* or *yellowish-white brilliant-looking spots or patches around the disk*, with *hemorrhagic extravasations into the retina* in the same locality. By the increase and union of the patches, the disk is often surrounded with a zone, "the inner line of which is irregularly circular, or melts into the gray interval and the disk itself, while the outer presents salient angles, which correspond to the course of the larger vessels" (Allbutt). Whitish streaks are also seen radiating outwards along the vessels and nerve-fibres.

In course of time, the disk is itself invaded by the spots and hemorrhages. Some suppose that the white spots always result from changes in blood-clots, but probably most of them are the result of independent exudation. Ultimately these may be absorbed, many of the vessels being obliterated or removed, causing retinal anæmia, while it is then seen that the choroid has undergone marked changes, and that it presents yellow patches. There are important structural changes in the retina, choroid, and vitreous body. Both eyes are always involved, but not to the same degree.

These ocular changes are unquestionably found most frequently and distinctly in connection with the "granular, contracted," variety of Bright's kidney, but they have been also noticed in other forms. As to their immediate cause, they have been attributed to hypertrophy of the heart accompanying renal disease; to some constitutional condition, attended with changes in the vessels generally; to alterations in the blood, viz., uræmia or deficiency of albumen; or to extension of disease along the optic nerve from the brain.

Having given this general outline of Bright's disease, the prominent characters of the several varieties will now be pointed out.

1. *Large, White, Smooth Kidney—Chronic Desquamative or Tubal Nephritis.*

ETIOLOGY.—This form is most frequently a sequel of the acute disease. It may come on gradually from taking cold, repeated pregnancies, or in the course of phthisis. It is chiefly met with in comparatively young persons.

ANATOMICAL CHARACTERS.—The kidneys are enlarged and heavy, their surface being smooth and pale, but variegated with vessels; the capsule is readily separated and unaltered, or somewhat opaque. A section shows great thickening of the cortical substance, which is white or yellowish-white and opaque, often also presenting numerous small yellow spots or streaks, due to fatty degeneration ("granular fatty kidney."—Johnson). The consistence is diminished. The pyramids retain their normal color, and contrast markedly with the cortex, though they are also affected to a less degree. *Microscopic examination* reveals enlargement of many of the tubes, which contain a great number of epithelium particles, with exudation. The cells are always much altered, being swollen, clouded, more or less granular, frequently containing fat- or oil-globules, or being quite disintegrated, only a granular débris remaining, with masses of fat and oil-globules. Some tubules may be quite denuded and empty, or only present hyaline fibrinous moulds. The Malpighian corpuscles are either normal in size or a little enlarged, and their capsules are thin.

In advanced cases this form of kidney occasionally gradually contracts and wastes, and it may become very small, owing to disintegration and absorption of portions of the cortical substance. The capsule is then more or less thickened, opaque, and adherent at parts; superficial depressions form, causing a somewhat granular appearance; while there is some increase in the interstitial tissue, and thickening of the bloodvessels.

PATHOLOGY.—The generally accepted view of the pathology of the large white kidney is, that it is the result of *chronic tubular nephritis*, attended with great increase and desquamation of the epithelium, the cells of which gradually undergo changes, ending in their complete fatty transformation and destruction. More or less loss of tissue, with atrophy, may follow in time.

SYMPTOMS.—Remaining frequently after an acute attack, or being chronic from the outset, this variety has the following clinical features: The urine is usually deficient in quantity; pale, and often somewhat turbid, depositing a whitish sediment, or from time to time being smoky or tinged with blood; of normal or rather high specific gravity; and it contains a considerable quantity of albumen, as well as various casts, with renal epithelium or its remains. The microscopic elements are not nearly so abundant as in the acute disease; by studying their prevailing characters, much information may be gained as to the exact state of the kidneys. The chief casts met with are "epithelial," the epithelium cells being always more or less altered, "granular," "large or small hyaline," and "fatty," as the renal structures undergo fatty changes. Anasarca is generally a prominent symptom, with serous effusions. The general surface, especially the face, presents the characteristic dull white, puffy, and pasty aspect, being often also smooth and glossy, these appearances being more marked as fatty degeneration proceeds. There is considerable tendency to uræmia and serous inflammations. Dr. Johnson states that mucous hemorrhages are frequent in the advanced stages, especially epistaxis. Exacerbations are very liable to arise.

2. *Granular Contracted, or Cirrhotic Kidney.—Chronic Interstitial Nephritis.*

Etiology.—Here the onset is always very chronic and insidious, without any obvious exciting cause. The contracted kidney is chiefly associated with gout, chronic lead poisoning, chronic alcoholism, a tendency to general degenerative changes, or, it is said, repeated exposure to cold. The subjects of this form of renal disease are usually advanced in years.

Anatomical Characters.—The prominent changes in this form of kidney are gradual contraction and atrophy, until the organ may weigh only an ounce or two; granulation of the surface, the granules ranging from the size of a pin's head to that of a pea or more, there being also irregular depressions, giving rise to a lobular appearance; thickening, opacity, and adhesion of the capsule, which is inseparable, and sinks into the depressions; increased resistance and toughness of the renal tissue. These changes are advanced to very different degrees in different cases. On section it is seen that the cortical substance is chiefly wasted, it having in some instances almost completely disappeared, what remains being of a red or brownish-red color and coarsely granular. There may be signs of fatty degeneration. Cysts are frequently observed, varying in size from very minute points to spaces equal to a nut or larger, and containing an albuminous fluid. In the gouty form of kidney a white deposit of urates exists in the tubules.

The intimate changes consist in a great increase of the intertubular fibrous tissue, with consequent alterations in the tubules, Malpighian corpuscles, and vessels. Many of the tubules are denuded of their epithelium, contracted, or obliterated; others are blocked up with disintegrated epithelium-cells; while still others contain clear fibrinous moulds. Fat-granules and oil-globules are often visible. The Malpighian bodies are shrunken and abnormally close together, their inclosed glomeruli being more or less compressed by fibrous tissue. Many vessels are obliterated, and the walls of the smaller arteries are thickened, hence it is difficult to inject the kidney through its main artery. The cysts so frequently seen are probably due to obstruction or constriction of the ducts at intervals, with distension of the intervening portions.

PATHOLOGY.—It is in connection with the cirrhotic kidney that important differences of opinion exist as regards pathological questions. With respect to its nature and mode of origin, German authorities consider it as being merely a *later stage of the large white kidney*, which, if it only lasts long enough, will become atrophied and granular, and some of their pathologists describe several stages in the progress of the morbid alterations in the kidneys. Though recognizing the fact that now and then the large kidney does waste, yet most English writers are of opinion that the true cirrhotic kidney does not so originate, but that it is the result of *chronic interstitial nephritis* attended with *proliferation of the intertubular connective tissue*, which becomes much increased and compresses surrounding structures. Dr. George Johnson, however, considers that the epithelial cells are first affected, undergoing degeneration from having to perform unusual excretory work. Dr. Dickinson believes that the disease begins superficially, immediately under the capsule, and gradually extends inwards.

Before alluding to a view more recently advanced, it will be convenient to consider certain morbid conditions of the heart and arteries, which are found with special frequency associated with the contracted kidney. It must be borne in mind that the heart may be primarily diseased, and by inducing mechanical congestion, lead to organic changes in the kidneys, ending in contraction and atrophy, this condition being, as previously stated, regarded by some as a variety of Bright's disease. Again, affections of the cardiac valves may coexist with renal disease independently, or as the result of the same constitutional dyscrasia; or they may be the consequence of endocarditis complicating Bright's disease. It is, however, to *cardiac hypertrophy*, especially involving the *left* ventricle, and presumed to be a secondary result of the renal disease, that it is requisite to draw particular attention. There can be no doubt but that this condition of the heart does arise in many cases of chronic Bright's disease, and the question is, how is it originated? Formerly it was attributed to the *altered state of the blood*, which was supposed to exercise an undue stimulation upon the heart, or to pass with difficulty through the capillaries, thus causing the heart to act with excessive vigor, and so to become hypertrophied. Traube advanced the opinion that *destruction of the renal secreting tissue and obstruction to the circulation in the kidney* lead to the hypertrophy, chiefly because a sufficient amount of water is not then removed from the blood, and thus the arterial tension is increased. Dr. George Johnson made the important discovery that the walls of the small arteries, not only in the kidneys, but also in various other structures throughout the body, are greatly thickened; he believes that this thickening is due to *hypertrophy of the muscular coat,* which is the consequence of the arteries opposing the passage into the tissues of the unhealthy blood associated with Bright's disease. Owing to this hypertrophy the walls of the heart become also hypertrophied, in order to overcome the resistance thus offered.

Still more recently Sir W. Gull and Dr. Sutton have denied that the thickening of the small arteries is due to muscular hypertrophy; they affirm from their observations that these and the capillaries throughout the body become the seat of a peculiar "hyaline-fibroid" change, which leads to thickening of their walls with loss of elasticity, and they attribute the cardiac hypertrophy to this "arterio-capillary fibrosis," as it is termed. On these observations they found another view as to the pathology of the granular kidney, viz., that it is but a part of a *general morbid condition,* beginning in the smaller vessels and affecting these throughout the body, which leads to atrophy of the tissues. In their opinion the vascular changes outside the kidneys are not the secondary result of the renal disease, but merely a part of the general disorder. The whole question is at present in a state of great uncertainty.

SYMPTOMS.—The contracted kidney may be clinically latent for a very long period. As regards the urine, this is, as a rule, abundant, being in some cases very copious; of light color and low specific gravity; while it contains comparatively little albumen, or even none at all at times, with but few or no casts, these being chiefly "hyaline" and "granular," with but little epithelium or fat. At the close the urine often becomes very scanty or suppressed. Dropsy is absent in a considerable number of cases from first to last, and as a rule it is but slight, or is only observed at intervals. The skin is dry and harsh, but does not exhibit the pale, pasty aspect, and the face has often a sallow, pinched appearance. In most cases there is marked debility and constitutional cachexia. Dyspeptic disturbances are frequently very prominent. The complications most liable to be met with are cardiac hypertrophy and morbid conditions of the vessels, the latter not uncommonly leading to apoplexy. Uræmia, serous and pulmonary inflammations are much less frequent than in connection with the large white kidney.

3. *Fatty Kidney.*

Fatty changes are observed in connection with all forms of Bright's disease, but some authorities are of opinion that the kidney may become *primarily* the seat of a *fatty infiltration,* the renal cells being loaded with fat, the liver being in most cases affected at the same time. Dr. Johnson applies the terms "simple fat kidney" or "general fatty infiltration of the kidney," to this condition. It is stated to be associated with any of the usual causes of fatty infiltration. The kidneys are frequently enlarged, their cortical substance uniformly pale or mottled with red, there being occasionally hemorrhagic spots. The consistence is diminished, and the kidney has often an œdematous feel and appearance. The microscope shows uniform distension of the renal cells with oil. There may be albuminuria and other symptoms of renal disease, but generally no obvious signs of functional derangement of the kidney are observed (Johnson).

4. *Lardaceous or Albuminoid Kidney.*

Most writers now classify the lardaceous kidney as a form of Bright's disease. Its etiology and pathology are those of the general disease. The affected organs are generally enlarged, and their surface is smooth, the capsule separating readily. The consistence is very tough and hard. A section is sharp-cut, and shows the cortical substance pale, anæmic, waxy, and translucent, often dotted over with glistening spots, which correspond to the infiltrated Malpighian bodies, in which the deposit first occurs. The cones seem natural. The usual chemical reactions of albuminoid material are yielded. The renal cells are often cloudy, withered, or fatty, but they are stated not to afford the tests of albuminoid deposit. The intertubular tissue is generally increased. Transparent fibrinous moulds are found in some of the tubules. In advanced cases the kidneys may become much contracted and irregular.

The *local clinical signs* which indicate implication of the kidneys in albuminoid disease, which have been mainly pointed out by Dr. Grainger Stewart, are as follows: The urine becomes very copious at first, pale and watery, depositing scarcely any sediment, of low specific gravity, this varying from 1005 to 1012 or 1015. At this time albumen is either absent altogether or is present only in very small quantity. Later on it increases, often becoming exceedingly abundant, while the urine is much diminished in quantity, and its specific gravity considerably raised. In the early period casts are few in number, consisting mainly of small hyaline and finely granular varieties. There may be some epithelial scales upon them, or these may be distinct, being usually wasted or containing oil-globules. Dr. Grainger Stewart states that the epithelial particles occasionally yield the reaction of albuminoid substance. In the stage of contraction there may be considerable sediment, in which are numerous large hyaline and granular casts. Dropsy is a common symptom, but in many instances it is probably to a great extent due to the general constitutional condition. Uræmic phenomena are very rare.

5. *Mixed Types.*

It need only be remarked here that kidneys are sometimes met with presenting combinations of the morbid changes described. Thus there may be a combination of the interstitial and tubal forms of disease; and Dr. Dickinson attributes the contraction of the latter in the later stages frequently to supervention of lardaceous disease; this may also accompany the large white kidney. As already remarked, fatty changes are common in all forms of Bright's disease.

CHAPTER LIII.

In the present chapter certain exceptional forms of urinary disease will be briefly considered.

CANCEROUS AND OTHER GROWTHS.

Of rare occurrence, renal cancer may be primary or secondary. It is most frequent in very young children and after adult age, and in males. The variety met with is almost invariably the encephaloid. The deposit is always in the nodular form when secondary, but when primary it may be either nodular or infiltrated. Secondary cancer does not attain any large size, but primary cancer frequently grows to enormous dimensions, usually giving rise to an irregular tumor. The consistence varies considerably, being sometimes very soft and almost fluctuating, while it is rarely uniform. Hemorrhage, softening, degeneration, and suppuration are liable to occur. The uninvolved renal texture is generally atrophied from pressure, or otherwise altered. Thickening of the capsule and adhesions are generally observed, while adjoining structures are frequently displaced or destroyed from pressure, the colon being always in front of the tumor. The pelvis of the kidney and ureter are often involved. In the great majority of cases only one kidney is affected. Secondary deposits are common, especially in the neighboring glands.

Symptoms.—The important clinical signs of renal cancer are severe pain in the lumbar region, generally shooting to the hypochondrium and thigh or in other directions, and subject to remissions or intermissions; tenderness; *hæmaturia*, in many cases profuse and irregularly intermittent, and occurring without any obvious cause; and the presence of a *renal tumor*, the special characters of which are the rapidity of its growth and the great size which it may attain, especially in children; its absolute immobility; as a rule its irregularly lobular feel; and its more or less firm, though unequal consistence. Occasionally there is an obscure sense of fluctuation in some parts. In some cases the superficial veins over it are much enlarged; it has been known to pulsate. Symptoms may arise from pressure of the tumor on surrounding structures. The detection of cancer-cells in the urine has been considered important, but several excellent observers doubt the possibility of recognizing them. Marked emaciation and debility, with cancerous cachexia, are frequently observed, and there may be signs of cancer in other parts. The course of the disease is very rapid in children, but comparatively chronic in adults.

Of the *non-malignant* growths very exceptionally found in the kidneys may be mentioned osseous, fibrous or fibro-fatty, enchondromatous, lymphatic or glandular, and syphilitic gummata. Some of these may form an evident tumor.

TUBERCLE.

There are three classes of cases in which tubercle is found in connection with the renal apparatus, viz.: 1. As a part of acute miliary tuberculosis, the kidneys being studded with gray granulations. 2. Secondarily to tubercular disease in the lungs or other organs, when it does not usually give rise to any symptoms. 3. As a primary deposit, generally involving the kidneys, their pelves and ureters, the bladder, and sometimes the urethra, being not uncommonly followed in the male by deposits in the prostate gland, testes, or vesiculæ seminales. The last is much the most important. In the kidneys the tubercle is seen at first as gray or yellow nodules in the cortex, which unite, become caseous and break down, forming irregular abscess-like cavities, which burst into the urinary passages, discharging disintegrated tuberculous matter and pus. Generally both kidneys are implicated, and they are frequently extensively or completely destroyed. In the pelvis and ureters the formation is in the submucous tissue, where it forms granules, and ultimately inflammation of the overlying membrane is excited, ending often in extensive ulceration and destruction. Occasionally one ureter is completely rigid and its canal blocked up, leading to pyonephrosis.

SYMPTOMS.—At first primary renal tuberculosis may be indicated by a dull pain in the region of the kidneys, with frequent micturition. The important symptoms, however, are those of chronic pyelitis or pyonephrosis, often with cystitis; great wasting, debility, and hectic; and in time implication of the lungs, intestines, or other organs. The urine is almost always deficient, slightly acid, and contains an abundance of pus, frequently a little blood, but not in any large quantity, extra-renal epithelium-cells, much granular detritus, and in some cases connective-tissue or elastic fibres. With regard to tubercle-cells, it is very doubtful whether they are ever seen. If the ureter is blocked, there will be a painful fluctuating tumor in the corresponding renal region, which may subside with coincident appearance of much pus in the urine, if the obstruction is removed. Uræmia is liable to arise if both kidneys are affected.

PARASITIC GROWTHS.

1. Occasionally a kidney, especially the left, is the seat of a *hydatid tumor*, which may ultimately attain a great size. It tends to burst into the renal passages, its contents escaping with the urine; very rarely it opens in some other direction, or it may undergo any of the changes to which hydatid cysts are liable.

SYMPTOMS.—There may be none throughout. The most prominent sign of renal hydatid disease is the existence of a *tumor*, rounded in form, though often somewhat irregular and lobulated, having an elastic or more or less fluctuating feel, and occasionally yielding "hydatid-frem-

and is not to be removed from the
by any person or
whatever

itus." As a rule there are no renal symptoms. Should the cyst burst into the urinary passages, important symptoms generally arise, viz., those of one, or, more commonly, several intermittent attacks of "nephritic colic," due to the escape of the vesicles by the ureters, preceded by a sharp pain in the renal region and occasionally a sense of something having burst, and followed by signs of their passage along the urethra, great pain to the end of the penis, constant desire to pass urine, with more or less retention, and finally by the appearance of the vesicles or their remains in the urine, frequently with some blood or pus. Occasionally, however, a cyst blocks up the ureter and leads to hydronephrosis. Inflammatory symptoms arise should the tumor become inflamed, or various symptoms may occur from its bursting in different directions.

2. The *cysticercus cellulosus* has been found in the kidneys.

3. The following worms are met with occasionally: *a. Bilharzia hæmatobia.* This worm is found in some other parts, but it is most injurious in connection with the bladder, ureter, and pelvis, being deposited in the minute veins of their mucous membrane. It belongs to the *trematoda*, being about 3 or 4 lines long, soft, and bisexual. The morbid effects it produces are hæmaturia, it being, as previously stated, considered the cause of the *endemic* hæmaturia of certain hot countries; the formation of raised, injected, and ecchymotic patches in the mucous membrane; local inflammation ending in suppuration; obstruction of the ureters, with consequent hydronephrosis, or pyonephrosis; or the formation of calculi, owing to the masses of ova forming a nucleus for urinary deposits.—*b. Strongylus gigans.* This is a *nematoid* worm, resembling in general characters the *ascaris lumbricoides*, but being much larger, having a reddish color, and presenting six nodular papillæ about the mouth. It is found in the kidney and urinary passages, and necessarily tends to give rise to considerable disturbance, but of no definite character. *c. Pentastoma denticulatum.* Supposed to be the larva of a worm, it occurs as a very minute encysted parasite, 1½ line long, club-shaped, with a double pair of hooks, and devoid of sexual organs.

Cystic Disease.

Dr. W. Roberts describes the following varieties of cysts in connection with the kidney: 1. Scattered cysts in kidneys otherwise healthy, which now and then attain a great size, so as to form a fluctuating tumor. 2. Disseminated cysts in the atrophic form of Bright's disease. 3. Congenital cystic degeneration. 4. General cystic degeneration in adults. The last affects both organs, but to different degrees. They are much enlarged, and converted into a mass of closely aggregated but distinct cysts, lodged in an abundant matrix of connective tissue, varying much in size, and containing either a limpid yellowish or reddish serum or a gelatinous substance, this yielding albumen but not urinary ingredients; subsequently other materials are often added. The renal tissue is partially or almost completely destroyed. The cysts do not as a rule open into the pelvis, which, with the ureter and bladder, is usually quite healthy. As to the origin of these cysts, they have been attributed to dilatation of the Malpighian capsules; or to distension of portions of the tubules, which are obstructed at each end. During life this condition may give rise to a tumor, which is sometimes extremely large. The urine is occasionally increased, and generally of low specific gravity. The termination is often by uræmic symptoms.

HYDRONEPHROSIS—DROPSY OF THE KIDNEY.

This condition arises from any permanent closure of the ureter. It is frequently congenital, but may subsequently occur from impaction of a calculus or other body; organic changes in the tube leading to stricture, such as ulceration with cicatrization; or external pressure by a tumor. As the result of this obstruction the pelvis and part of the ureter above the impediment become dilated from accumulation of urine; this then causes flattening of the papillæ and gradual compression and atrophy of the pyramids, followed by wasting of the cortex, with distension of the capsule, until ultimately nothing may be left but a membranous sac, either single or divided into chambers, sometimes attaining an enormous size, and containing fluid. The latter consists usually of altered urine, but much more watery than the normal secretion, almost always a little albuminous, and sometimes presenting blood, pus, or epithelium. As a rule only one kidney is affected, and then the other becomes hypertrophied.

SYMPTOMS.—Evidence of some cause likely to give rise to obstruction of the ureter may help in giving clinical indication of hydronephrosis. The only positive sign, however, is the existence of a painless, soft, more or less fluctuating renal tumor, which sometimes feels lobulated, unaccompanied by any unusual characters of the urine. Occasionally the obstruction is removed, and the tumor suddenly subsides with copious discharge of urine, which is highly characteristic; the sac may afterwards shrivel up. It may be necessary for diagnosis to use an exploratory trocar or the aspirateur. The tumor may cause symptoms by pressing on the surrounding parts. It is curious that when hydronephrosis is double, uræmic symptoms do not arise for a considerable time. Most cases ultimately terminate fatally in various ways. Extremely rarely does the sac rupture spontaneously.

CHAPTER LIV.

URINARY CALCULUS AND GRAVEL.

THE full consideration of this subject comes more appropriately within the scope of surgical works, and here it is only intended to give a brief outline of its main points. By "gravel" is meant very small concretions, which are often passed in the urine in large numbers.

VARIETIES OF CALCULI AND THEIR CHARACTERS.—1. *Uric Acid.*—This is very common both in the form of calculi and gravel, being especially associated with the gouty diathesis, and hence occurring mainly in elderly persons and among those of the upper classes. The concretions are formed in very acid, high-colored, concentrated urine. They are hard, heavy, minutely tubercular or smooth on the surface, generally oval and compressed, as a rule small or of moderate size, and variously colored by urinary pigments. There may be several. 2. *Urates*, chiefly consisting of urate of ammonia. These form soft irregular concretions, deposited from acid urine, almost always in the kidneys, and nearly limited to young children. They are soluble in hot water. 3. *Oxalate of Lime or Mulberry Calculus.*—This is characterized by the surface being rough and tuberculated like a mulberry. It is of moderate size, generally spherical, very hard, and dark brown or almost black. 4. *Phosphatic Calculi.*—The important variety is the *fusible calculus*, consisting of mixed calcic and ammonio-magnesic phosphates. It is almost always formed in the bladder and on a nucleus of some other material. There is no limit to the size which may be attained. The texture is loose and friable, easily breaking down, and presenting a chalky or earthy appearance. Crystals of triple phosphate often stud the surface. By heating with the blowpipe, this calculus fuses into an enamel-like material. Another rare variety is the *basic phosphate of lime* or *bone-earth calculus*, which is very white, chalky-looking, and soft. Among the exceptional varieties of calculus are: 5. *Carbonate of lime.* 6. *Cystin*, usually ovate, yellow but changing to pale green on long exposure to light, lustrous, mammillated on the surface, friable, and soft. 7. *Xanthin.* 8. *Fatty or saponaceous concretions.* 9. *Fibrinous and blood concretions.* 10. Some calculi are *alternating*, consisting of alternate layers of two or more primary deposits.

PATHOLOGY.—Most of the calculi mentioned are of renal origin, being due to a deposit from the urine as it is first excreted, in the tubules of the kidney, pelvis, or infundibula. Such are termed *primary calculi*, and the theories as to the cause of their formation are: 1. The presence in excess of certain normal ingredients in the urine (uric acid, oxalates, &c.); or of some sparingly soluble abnormal ingredient (cystin, xanthin). 2. Certain conditions of the urine diminishing its solvent power over some of its constituents, *e. g.*, excessive acidity or deficiency of chloride of sodium and alkaline phosphates, diminishing the solubility of uric acid and urates; alkalinity from fixed alkali leading to a deposit of bone-earth phosphate or carbonate of lime. 3. The presence of some body suitable to form a nucleus for deposits. The *mixed phosphatic calculus* is almost always formed *in the bladder*, and results from decomposition of the urine, which becomes ammoniacal; this condition being, as already explained, favorable for the deposition of earthy phosphates, which are often mixed with a little urate of ammonia and carbonate of lime. Hence it is named a *secondary calculus*, and the deposit always takes place on some nucleus, this being generally a calculus which has passed into the bladder. If the urine is retained in the renal pelvis, and becomes ammoniacal, a phosphatic calculus may form there. In structure a calculus usually consists of a *central nucleus*, surrounded by the *body*, and outside all there may be a phosphatic *crust*. The nucleus may or may not be of the same composition as the rest of the calculus, or sometimes it consists of some foreign body, or mucus, or blood. A section generally shows a stratified arrangement, but it may be partly or entirely radiated. Blended in the structure of calculi there is always a little organic matter, including mucus, epithelium, blood, pus, pigment, &c. The morbid effects liable to be excited by renal calculus are: 1. Hemorrhage, from direct injury to some part of the urinary apparatus. 2. Renal congestion, or inflammation ending in abscess. 3. Pyelitis or pyonephrosis. 4. Hydronephrosis and renal atrophy as the result of impaction in the ureter. 5. Cystitis. Occasionally calculi become lodged in cysts or pouches, and give rise to no further mischief. It sometimes happens that one ureter is already occluded, and a stone lodges in the pervious one, leading to complete suppression of urine with uræmia. Very rarely a stone makes its way out of the renal apparatus into other parts, such as the peritoneum or intestines.

SYMPTOMS.—The clinical signs of urinary calculus are chiefly derived from the effects above mentioned, and they need not be described here. It is only requisite to point out what symptoms are suggestive of a stone in the kidney, and to describe those characteristic of its passage along the ureter to the bladder.

The symptoms of *calculus in the kidney* are pain over the renal region, of a dull, aching character, also frequently shooting towards the testes and thighs; pain at the end of the penis; frequent micturition; and the presence in the urine of blood, pus, pithelium from the pelvis and infundibulum, or unorganized ediments, as uric acid, oxalates, &c. These are usually aggraated by anything which disturbs the position of the calculus, specially violent exercise or jolting, after which the symptoms ften assume the characters of *nephritic colic*, this in its typical orm being due to the passage of a calculus along the ureter to he bladder. It is characterized by sudden excruciating pain in ne renal region, shooting in various directions, but especially to he hypogastrium, testis, end of the penis, and inside of the high; great restlessness, the patient tossing about in all direcions to try to obtain relief; constant desire to micturate, the rine, however, being very scanty or suppressed, what is passed eing high-colored, often bloody, and discharged in drops with uch burning pain; retraction of the testicles; collapse and faintess, with cold, clammy sweats, and a very feeble pulse; generlly distressing nausea and vomiting; great anxiety; and someimes spasm of the muscles or general convulsions. The attack asts a variable time, there being commonly temporary remisions, and if the calculus reaches the bladder, the symptoms usully subside with equal suddenness, with a sense of intense relief, nd the patient may be conscious of something having fallen into he bladder. If the attack lasts some time, more or less pyrexia s liable to be set up.

CYSTITIS—VESICAL CATARRH.

Diseases of the bladder are mainly surgical, but it is necessary o allude to cystitis, as this complaint is not uncommon in medial practice.

ETIOLOGY.—The causes of vesical catarrh are: 1. Direct irriation, especially by calculi and morbid growths, or from certain onditions of the urine, as after taking excess of cantharides, opaiba, beer, or spirits, but particularly when it becomes ammoiacal as the result of retention from some impediment to its scape, or from paralysis in spinal disease. 2. Extension of inammation in the vicinity, especially that of gonorrhœa. 3. Exosure to cold or wet. 4. Acute exanthemata occasionally.

ANATOMICAL CHARACTERS.—Acute cystitis is characterized y redness, swelling, and softening of the mucous membrane, with formation of excess of mucus and detachment of epithelium with young cells. In the chronic form the color becomes often dirty gray or brown, there is thickening of the tissues, with, in time, hypertrophy of the muscular coat, the walls becoming much thicker and tough. Abundant muco-purulent or purulent matter forms in the bladder, and the surface may ulcerate or even become gangrenous in time, or suppuration between the coats may take place, ending in extensive destruction and structural changes. The urine is generally decomposed and ammoniacal. This has been supposed to be the result in some cases of an alkaline fermentation set up by the mucus formed in the bladder. Niemeyer and others, however, have advanced the opinion that this decomposition is generally the consequence of the repeated use of dirty catheters, by which low vital organisms are introduced into the bladder.

SYMPTOMS.—The prominent symptoms of acute cystitis are uneasiness and a sense of heat over the bladder, in the perineum, and along the urethra; in some cases tenderness in the hypogastrium; constant inclination to micturate, a few drops of urine being passed, which causes great pain and burning; and the presence of more or less mucus in the urine. There may be some pyrexia. The chief indication of chronic cystitis is derived from the urine, which contains much mucus and epithelium or pus, or sometimes blood, and if the urine is ammoniacal, the pus is converted into a gelatinous, ropy, adhesive substance, which is poured with difficulty from one vessel into another, and may be drawn out into strings. In time there is often much constitutional disturbance, with hectic, and, if there is extensive suppuration or gangrene, low typhoid symptoms are liable to arise, or those of peritonitis.

CHAPTER LV.

GENERAL DIAGNOSIS OF URINARY AFFECTIONS.

THE diagnosis of urinary diseases is founded on the history of the case as revealing some of the causes of these complaints; the symptoms present referable to the urinary organs, and their characters; physical examination, especially as regards the state of the urine; the presence of symptoms remotely due to the renal disorder, particularly dropsy and uræmic phenomena; and the general or constitutional state. The cases may be arranged under certain groups.

1. *Acute Inflammatory Affections.*—These include *acute Bright's disease*, *suppurative nephritis*, *pyelitis*, and *perinephritis*. In all there is generally much pain in the kidneys, with functional disturbance, and pyrexia, but they may generally be distinguished by the circumstances under which each occurs, the characters of the urine, and as regards Bright's disease, by the dropsy and other characteristic symptoms which accompany it. In *pyelitis* the presence in the urine of epithelium from the pelvis and infundibula is highly important, and later on pus appears. *Suppurative nephritis* may give rise to physical signs of an abscess in the renal region. *Perinephritis* is, as a rule, but not invariably, distinguished by the absence of any morbid characters of the urine. *Active congestion* might possibly be mistaken at first for some of the inflammatory affections, but the milder character of the symptoms and their speedy subsidence sufficiently characterize it. Acute cystitis sometimes simulates renal inflammation.

2. An important group of cases are those including the varieties of *chronic Bright's disease*. The existence of this disease is often quite evident from the history and the symptoms, especially the characters of the urine. However, the only sign of the affection may be albuminuria, and therefore it is most desirable to get into a routine practice of examining the urine, especially if an individual is persistently out of health without any obvious cause, or suffers constantly from dyspeptic symptoms or headache. Of course it must be remembered that albuminuria may be due to other causes besides renal disease, especially cardiac obstruction or admixture of albuminous fluids. Careful microscopic examination is necessary, so as to detect casts if present. The ophthalmoscope is highly important in diagnosis in some cases, and its employment has not unfrequently been the means of revealing Bright's disease where it was previously unsuspected.

The diagnosis between the different varieties is founded on the conditions under which they arise, and their special symptoms, which have already been pointed out. The stage of degeneration of the kidneys may often be determined with much accuracy by a careful observation of the microscopic elements. Acute Bright's disease may occur as an exacerbation of the chronic form, and it is very important to determine whether such is the case or not by the previous history, the presence or absence of any evident cause of the acute attack, and the characters of the urine; if there is much blood and renal epithelium discharged, and if the elements do not show signs of degenerative changes, the case is probably recent and acute. The occurrence of an acute inflammatory affection or uræmia in the course of chronic Bright's disease not previously known to exist, may be very puzzling. The rule of always examining the urine will generally lead to the detection of the renal affection.

3. In certain urinary affections the prominent symptom is the discharge of *blood* or *pus* in the urine. Some of the points to be noticed in making out the source and pathological cause of these have already been considered, and in addition the following are important, viz.: The history and previous symptoms as revealing some cause, such as calculus or stricture; the seat of local symptoms, whether pointing to the kidney, bladder, or urethra; the characters of the urine, with the amount of the abnormal ingredient, its mode of admixture and exact appearances, the manner in which it is discharged, and the other microscopic elements with which it is mixed; the results of thorough physical examination; and the general symptoms present. With regard to *pyuria*, one of the chief difficulties is to tell whether it results from pyelitis or chronic inflammation of the bladder and lower passages, especially when these conditions are associated. The presence of epithelium from the pelvis and infundibula is very important at first in revealing pyelitis, but it disappears in time; if the complaint exists alone, however, the local symptoms and discharge of *acid* urine containing much pus, especially if with a history of some cause, are sufficiently distinctive. When pus comes from the bladder, it is frequently ropy and tenacious, on account of ammoniacal urine, being discharged mainly towards

the end of the act of micturition. When disease of the lower passages and bladder has been in existence for a length of time, it is highly probable that the kidneys are involved. When pus originates in urethral inflammation, there are the local signs of this, while pus escapes *before* the urine, and can be pressed out independently. In doubtful cases of leucorrhœa, it has been recommended to pass a catheter, and thus remove some of the urine directly from the bladder for examination.

4. Occasionally the chief matter in diagnosis is to determine the nature of a *tumor in the renal region.* This may be due to *renal abscess, pyonephrosis, hydronephrosis, cancer* or a *non-malignant growth, hydatid disease, cystic degeneration of the kidneys,* or *perinephritis.* The distinctive features of these have been sufficiently pointed out in their description, the characters of the enlargement and of the urine being important elements in diagnosis. It may be requisite to employ an exploratory trocar. The tumor may become so large as to fill the abdomen, so that it becomes impossible, except by the history, to tell its origin; and when due to fluid accumulation it may simulate ascites. A renal tumor may be mistaken for one in connection with the ovary, uterus, suprarenal capsule, liver, spleen, or neighboring glands; or for an accumulation in the intestines.

5. *Pain* is often referred to the renal region, but this is commonly due to myalgia, neuralgia, accumulations in the colon, and other causes. Should there be reason to suspect *calculus,* careful and repeated examination of the urine must be made, particularly for uric acid and oxalates, epithelium from the urinary passages, traces of blood or pus, and it may be well to do this after the patient has taken some severe exercise. As a rule *nephritic colic* is easy to diagnose, but the same symptoms may result from the transit of a blood-clot or hydatid vesicle. An attack may also be simulated by the passage of a gallstone, severe neuralgia, or intestinal colic.

General Prognosis.

Any organic disease of the kidneys is serious, especially if it is extensive and if both organs are involved. Of the *acute* affections, Bright's disease demands the first consideration. A large number of cases recover completely, but there is a tendency to lapse into the chronic state, and it is necessary to watch the urine carefully for some time, before giving a final prognosis. If with the subsidence of the symptoms the albumen and other abnormal ingredients steadily diminish, and the urine is gradually restored to its normal characters and composition, the prognosis is favorable. Even should slight albuminuria hold on for some time, accompanied with a few casts, the case may end in ultimate recovery. If albumen continues abundant for a length of time, the prognosis becomes more serious; much will depend also on the presence and characters of the casts, whether these show that the disease is subsiding, or that it is becoming confirmed, with degenerative changes in and destruction of the epithelium. Recovery cannot be considered satisfactory until every trace of albumen has disappeared. The immediate prognosis is more grave if the urine becomes very scanty, and contains a large quantity of albumen, blood, and casts. The chief signs of immediate danger are uræmic symptoms; œdema of the glottis and lungs, or abundant pleuritic or pericardial effusions; severe erysipelas complicating dropsy; and acute inflammatory complications.

Suppurative inflammations about the kidney are very serious, on account of the interference with the urinary secretion, the constitutional disturbance, and the dangers of rupture of the purulent accumulation. Pyelitis differs much in its gravity according to its duration, its cause, and whether it is single or double. When confirmed it is always serious, but even after complete destruction of the kidney recovery may follow if only one organ is involved. Calculous pyelitis is much more favorable than that which follows chronic disease in the lower passages, or that which is excited by tubercle or cancer.

The prognosis in chronic Bright's disease, while always more or less unfavorable, differs much in different cases. The termination is most rapid in the large white kidney, but much will depend on the exact nature and extent of the changes in the kidneys, as revealed by the urine. Patients suffering from this complaint may, however, live for many years, and even enjoy comparatively good health. The circumstances which render the prognosis more unfavorable are a long duration of the disease;

steady diminution in the quantity of the urine, without corresponding increase in density; excessive albuminuria, with abundant granular and fatty casts or oil-globules; extensive dropsy, with serous effusions; obstinate dryness of the skin; marked cardiac hypertrophy and vascular changes; persistent dyspepsia or disturbances of the bowels; and constant pyrexia. It is wonderful, however, how much improvement in symptoms may be brought about in some apparently hopeless cases. There is always a danger at any moment of the supervention of uræmia, acute exacerbations, or inflammatory complications, the last being very easily set up and being much more grave than usual.

Patients suffering from Bright's disease are very bad subjects for injuries or operations.

It is unnecessary to allude particularly to the prognosis of the rarer forms of renal disease. With regard to *calculus*, there are a good many dangers attending it; it may produce extensive disorganization, and its passage to the bladder may prove fatal. If the stone is very large, or if there are several, the prognosis is worse. Calculus is a disease liable to recur.

GENERAL TREATMENT.

1. *Acute Inflammatory Affections.*—The general measures applicable at the outset to all forms of acute renal inflammation are to keep the patient in bed, completely at rest; to cup over the loins to the extent of from 6 to 10 or 12 ounces, if the case is favorable, or otherwise to dry cup freely; to apply hot poultices or fomentations constantly across the loins; to give low diet, with abundance of diluent drinks; and to make the bowels act well. In *suppurative nephritis*, should there be signs of an abscess, this should be encouraged to the surface, and opened when the proper times arrives. At this time much support may be required, especially if there are typhoid symptoms. In *pyelitis* it is very important to remove the cause, if possible; and when it is due to a calculus, a considerable amount of opium or subcutaneous injection of morphia is often needed in order to ease the pain.

The treatment of *acute Bright's disease* calls for special consideration. Removal of blood requires particular caution, on account of the tendency to anæmia, and it should be omitted if the patient is weak, and especially if chronic renal disease has previously existed. The most important object in treatment is to endeavor *to get the skin to act freely and persistently.* This is best effected by making the patient wear flannel, lie between blankets, avoiding every source of draught, and make use of warm, hot-air, or vapor baths, repeated daily or less frequently as circumstances indicate. Dr. W. Roberts recommends the warm "blanket-bath." Internally full doses of citrate or acetate of potash or liq. ammon. acetatis may be given, freely diluted, with a few minims of tincture of henbane, and some authorities highly recommend small doses of tartar emetic or antimonial wine. There is much difference of opinion as to the use of *diuretics.* The experience of many practical observers proves that some of them may often be given with great benefit. In the first place the patient should drink water freely, in order to aid in eliminating and washing away the urinary solids and the materials accumulating in the kidneys. All stimulants must be forbidden in the acute stage. In addition to the vegetable salts of potash already mentioned, cream of tartar, digitalis, and infusion of fresh broom-tops have been beneficially employed in combating the dropsy. The bowels must be made to act freely by means of a dose of compound jalap powder every morning or on alternate mornings, and this may be combined with cream of tartar. Later on podophyllin or elaterium may be required if the dropsy does not subside.

Various symptoms frequently call for attention during the course of acute Bright's disease, especially vomiting and uræmic phenomena. The management of inflammatory complications, especially those in the chest, is often a matter of much difficulty. Lowering treatment is decidedly not admissible, and on no account must mercury be given, as in renal diseases the smallest dose is liable to produce most serious salivation. Blistering and application of turpentine require great care, as they tend to irritate the kidneys. Opium must also be avoided, or only given very cautiously. Free dry cupping, sinapisms, warm fomentations or poultices, and chloroform epithems are the best local applications.

After the more acute symptoms have subsided, the diaphoretic, diuretic, and purgative remedies must be moderated, and at this time the most valuable medicine is *iron*. Care is needed in commencing with this drug, and it should be given at first in a mild form, in small doses, its effects being carefully watched. The tincture of the sesquichloride, syrup of phosphate, ammonio-citrate, or ferrum redactum are the best preparations, and if the first is tolerated in full doses, excellent results are brought about. Quinine may be combined with it, and this remedy is particularly recommended after scarlatina. The diet should be gradually improved, being made nutritious and digestible, and during convalescence a little wine may be given if it agrees. The greatest care is necessary at this time to guard against a relapse. The patient should always wear flannel all over the body, and avoid every possible exposure—indeed it is advisable to enforce confinement to the bedroom until the albumen has quite disappeared, and for some time much care is needed. Afterwards a change to a warm protected neighborhood is very beneficial, or this may be recommended if the case tends to become chronic.

2. *Chronic Bright's Disease.*—This complaint requires very careful and varied management, and it is difficult to indicate any definite line of treatment applicable to all its forms. Still there are certain principles to be followed, which will now be pointed out.

a. It is very important to find out the *cause* of the disease, and remove it if possible, *e. g.*, abuse of alcohol, constant exposure, or suppuration setting up albuminoid disease. *b. Hygienic* and *dietetic* management demands careful and constant attention. In those cases where there is merely albuminuria, this is often all that is needed. The patient must be completely clad in flannel, avoid exposure, especially a chill or wet, and take moderate exercise daily. If possible, a residence in a tolerably warm, equable, and sheltered district is advisable, or a temporary change to such a district should be recommended. A sea voyage is sometimes highly beneficial in cases not far advanced. It is very necessary to keep up a free action of the skin, by means of warm and other baths with friction. The diet requires supervision, being made of a nutritious and digestible kind. Milk may be usually taken in large quantities. Skimmed-milk has been specially recommended in the treatment of Bright's disease, as in diabetes. Strong stimulants are better avoided, but light wines or a glass of good bitter ale often do good. The bowels must be kept well opened daily, and the digestive powers maintained in good order. *c.* Treatment directed to the *constitutional state* and to the *condition of the blood* is of the highest value. The administration of *iron*, regularly and perseveringly carried out, often produces the most beneficial results, improving the state of the blood and general system. If it can be taken, the tincture of steel is the best form, or the solution of pernitrate, but the saccharated carbonate, ferrum redactum, syrup of iodide or phosphate, ammonio-citrate, or citrate of iron and quinine, are also very useful. Among other constitutional conditions requiring special attention are phthisis, albuminoid disease, gout, and saturnism. *d.* Some authorities consider it desirable to *diminish the amount of albumen* discharged, by means of tannic or gallic acid, mineral acids, alum, or iodide of potassium. It is very questionable whether any of these are efficacious in this direction. *e. Dropsy* is the chief symptom calling for interference in a large proportion of cases of Bright's disease. *Purgatives* and *baths* are the remedies. Among the former jalap, cream of tartar, elaterium, scammony, gamboge, and podophyllin, are the most useful. Some give liq. ammoniæ acet. freely with iron, to act as a diaphoretic; others recommend James's or Dover's powder. Opinions are much divided with regard to *diuretics*, both as to the propriety of giving them, and as to the most efficacious. In my experience certainly they are not of much use as a rule, and they may do considerable harm. In extreme dropsy, puncture or incision of the skin of the legs or scrotum may be required. Great care is necessary when this is done, to guard against erysipelas, by applying warm moist flannels, frequently changed and thoroughly cleansed before being reapplied, and by sponging the parts well each time. Some employ antiseptic washes. Particular care is also needed against pressure, or irritation by urine. *f.* Among other symptoms which are likely to require treatment are those of dyspepsia, vomiting, derangement of the bowels, headache, and uræmia. The remarks made under acute Bright's disease as to inflammatory complications apply here also. *g.* It is necessary to warn patients against the dangers to which they are exposed, and impress upon them the necessity of paying strict attention to the hygienic matters already mentioned. If there is cardiac hypertrophy, with changes in the vessels, the danger of the occurrence of cerebral hemorrhage should be borne in mind.

3. *Purulent Discharge in the Urine.*—Should this symptom require special treatment, the principles are: *a.* To remove any obvious cause of the suppuration, if possible. *b.* To administer remedies to check the formation of pus, the chief being alum, astringent preparations of iron, mineral acids, tannic or gallic acid, vegetable astringents, particularly decoction of uva ursi or buchu, metallic astringents in obstinate cases, balsams and resins, especially balsam copaibæ and turpentine. If the bladder is affected, injections of warm water are useful, or even astringent injections carefully employed. *c.* To support the general health and treat the constitutional state by good diet, change of air, sea-bathing, tonics, and cod-liver oil.

4. Some conditions of the kidney occasionally need *operative interference.* In *pyonephrosis* or *abscess of the kidney* it may be requisite to let out the pus. In *hydronephrosis* the first point is to endeavor to remove the obstruction which causes the retention of urine, and frequent manipulation and shampooing of the tumor has sometimes been found effectual. If this does not succeed, and there are indications of danger, tapping must be resorted to and repeated if necessary. *Hydatid tumor* must be treated in the manner before described in connection with the liver. The removal of the kidney for cancer or other solid tumor is scarcely permissible, but has been performed.

5. The treatment of *calculus* is very important. In the first place measures should be taken to *prevent its formation,* if the urine gives indications that there is a danger of this, or if there has been a previous history of stone. The chief general measures recommended for this purpose are, to make the patient drink freely of water, so as to maintain the urine in a dilute state; not to allow too long intervals between meals, but to take four or five light meals during the day; and not to lie too much in the recumbent posture, the hours of sleep being moderate. Uric acid calculus is further guarded against by strict regulation of diet,

which must be mainly farinaceous, all heavy meals with much meat and rich wines being avoided; and by administering moderate quantities of bicarbonate or citrate of potash. Oxalate of lime calculus is prevented by keeping the urine very dilute: maintaining the activity of the skin; avoiding certain vegetables rich in oxalates, especially rhubarb and sorrel, and also calcareous waters: and giving alkaline carbonates. Phosphatic calculus is obviated by careful attention to the bladder, if this organ is diseased, and by endeavoring to change the character of the urine; if it is ammoniacal, it may be desirable to wash out the bladder with dilute acids. It has been thought possible to *dissolve* calculi after their formation—those of uric acid in the kidneys by administering acetate or citrate of potash freely in frequently repeated doses; those of phosphates, by dilute acid injections into the bladder. For *nephritic colic* the remedies are free administration of opium by mouth or rectum, or subcutaneous injection of morphia; belladonna, if opium is not admissible; warm baths, with fomentation or poultices over the loins; and the free use of warm demulcent drinks. It may be necessary to cup the loins. Change of posture and manipulation along the ureter have been said to aid in the passage of a calculus. If the pain is extreme, it may be desirable to administer chloroform. Vomiting and collapse must be attended to. Surgical treatment is of course usually required when a stone reaches the bladder, and in rare instances it has been found necessary to remove a large calculus by operation from the pelvis of the kidney, but only if it has led to an abscess. The treatment of the pathological conditions induced by stone have already been considered.

CHAPTER LVI.

DISEASES OF THE ABSORBENT GLANDS.

CLINICAL CHARACTERS.—The signs to be sought for as indicating morbid conditions of the absorbent glands are: 1. *Pain* and *tenderness* in these structures, often with a feeling of *stiffness*. 2. *Enlargement*, generally accompanied with *changes in consistence.* This may be limited, or affect the glands extensively throughout the body, not uncommonly giving rise to considerable tumors. The superficial glands are either distinct, or tend to form nodular, irregular, firm masses, owing to a number of glands being aggregated together, or chains of these may be involved. Those of the neck, axilla, and groin are most commonly affected. In the chest they may give rise to the physical signs of *mediastinal tumor.* They can frequently be felt in the abdomen by making steady deep pressure or grasping portions of the walls, either as separate nodules or as a distinct tumor. The latter is deeply situated, nodular, and fixed, being usually not very large. 3. *Interference with the passage of Lymph and Chyle.*—It has been supposed that obstruction to the passage of lymph may lead to its coagulation and to a kind of solid œdema. Interference with the progress of the chyle will gravely affect the nutrition of the body, and thus induce emaciation. 4. *Evidences of Pressure upon, Irritation, or Destruction of neighboring Structures.*—These will of course vary with the situation of the enlarged glands. Neuralgic pains and localized œdema are not unfrequently observed, owing to nerves and veins being affected. In the chest and abdomen more or less of the signs of pressure may be present, as in the case of other tumors. By their irritation also inflammation of serous membranes and other structures may be excited. The glands are liable to undergo destructive changes, which may implicate neighboring parts, causing serious damage. For instance, they may suppurate and destroy the cutaneous structures; or in the chest lead to destruction of portions of the lungs, or perforation of air-tubes or vessels; in the abdomen to perforative peritonitis or perforation of the bowels. 5. *Symptoms indicating some Constitutional Cachexia.*—These are of much importance, necessarily differing in their character according to the nature of the disease.

SPECIAL DISEASES.

1. The absorbent glands are very liable to become the seat of *active congestion* or *acute inflammation—adenitis*—especially from some neighboring irritation conveyed along the absorbent vessels; from some infective poison, *e. g.*, syphilitic virus; or from injury and straining. This may subside or go on to suppuration, or leave the glands chronically enlarged, especially if the irritation is repeated several times. The only symptoms are pain, tenderness, stiffness, and swelling of the affected glands, which may be followed by signs of the formation of an abscess. There is frequently some pyrexia. *Chronic inflammation* is set up in

some cases, the glands becoming gradually enlarged and hardened; and they may subsequently degenerate or form abscesses.

2. A very important morbid condition of the glands is that of *simple hypertrophy* or *lymphadenoma*. This has been previously alluded to as occurring in one form of *leucocythæmia*, and it is the prominent anatomical character of what is known as *Hodgkin's disease*, which is presumed to be a constitutional affection, essentially characterized by hyperplasia of the glands more or less throughout the body, followed by increase of the lymphatic tissues in the spleen, liver, lungs, and various other structures. The glands often form considerable tumors, superficial or in internal cavities, of somewhat soft consistence. Microscopic examination shows that the enlargement is entirely due to hypertrophy of the gland-tissue. Clinically, in addition to the enlarged glands, which are generally painless, there are signs, as a rule, of profound constitutional disturbance, which may precede the glandular hypertrophy, characterized by extreme anæmia, with its accompanying symptoms, and often an appearance of severe illness; marked muscular weakness, the patient frequently tottering and trembling; feeble circulation; and great emaciation. Œdema of the legs is common. There is no increase of white corpuscles in the blood. In one case which came under my care, the course of the disease was quite acute, attended with considerable fever and profuse perspirations, vomiting and purging, and mental wandering at times. On the other hand, I have seen several instances in which the glands of the neck, axilla, &c., were extensively hypertrophied, where the system did not appear to be much affected, the patients enjoying very fair health.

3. SCROFULOUS OR TUBERCULAR DISEASE.—In scrofulous subjects, especially children, one of the prominent characters in many cases is chronic enlargement of the external glands, especially those of the neck, there being a subsequent tendency to degeneration and breaking down of their structure, with unhealthy suppuration. In other cases the glands within the abdomen and chest are extensively affected. The enlargement was formerly considered as being due to an unhealthy chronic inflammation, or to a deposit of tubercles. Now, however, it is known to be the result of hyperplasia of the lymphatic elements, these consti-

tuting the "tubercles." They have a very low vitality, and are very liable to become speedily disorganized and caseous, and they may finally dry up and calcify, or go on to unhealthy suppuration and burst or destroy neighboring tissues. When the affected glands are superficial they are easily recognized. In the chest they constitute the disease named *bronchial phthisis*, and in addition to causing the signs of a tumor, the glands are liable to soften and give rise to excavations, involving the lungs ultimately, or opening into the trachea or a bronchus, the pleura, or a great vessel. If they communicate with the air-passages, there is much expectoration of muco-purulent or purulent matter, often of blood, caseous matter, and calcareous particles. When the *mesenteric glands* are implicated—*Tabes mesenterica*—they may be felt separately or as a mass, and often give rise to symptoms of peritoneal irritation or inflammation, flatulence, colicky pains, and other digestive disturbances. Owing to the flatus the abdomen is generally much distended. Appetite may be excessive, lost, or capricious. The bowels are frequently irregular, either constipated or relaxed, with unhealthy stools. In exceptional instances the softened glands have ruptured into the peritoneum or intestines. In this variety of gland disease there is usually considerable constitutional disorder, indicated by emaciation, debility, and fever tending to a hectic type. The loss of flesh is frequently extreme when the lacteal glands are affected, and it is also very marked in bronchial phthisis if the glands break up. In children, in whom this complaint is much the most common, there is in many cases no evidence of tubercle in other organs; but in adults the lungs or other structures are generally involved. Recovery may be brought about even when the glands throughout the body have been extensively affected, many of them remaining as calcified masses.

4. LARDACEOUS DISEASE.—The glands are often the seat of albuminoid infiltration. They are then very firm, small, and on section present the characteristic pale, homogeneous, waxy appearance. In the abdomen they can be felt as little hard masses, separate, and readily movable. The constitutional symptoms are those of the general disease.

5. CANCER.—As a secondary deposit cancer is very liable to

implicate the absorbent glands in the neighborhood of any structures affected with this disease. It may commence in them primarily. All forms are met with, and large, hard, nodulated tumors are often formed. The clinical phenomena are mainly those due to the tumor, with evidences of the cancerous cachexia. The glands are generally very painful and tender.

DIAGNOSIS, PROGNOSIS, AND TREATMENT.

DIAGNOSIS.—It is unnecessary to enter at any length into this subject, as the diagnosis of the different affections of the glands will be evident from the descriptions just given, special attention being paid to the constitutional condition, and to the physical characters presented by the glands. The main difficulty is in determining *disease of the glands in internal cavities* and in making out their exact condition. Glandular disease must be always borne in mind as a prominent cause of wasting in children, especially affections of the mesenteric and bronchial glands.

PROGNOSIS.—This will depend on the nature of the disease; the state of the constitution; the situation and extent of the glands affected; and the changes which they undergo. In internal cavities enlarged glands by their mere pressure or destructive effects are liable to give rise to much mischief. Extensive glandular disease in children, particularly when the mesenteric glands are involved, is very serious.

TREATMENT.—1. In acute adenitis the principles of treatment are to remove the cause, keep the affected part at rest, and use warm fomentations and poultices freely. Should suppuration occur this must be managed on the usual principles. 2. In chronic affections *constitutional treatment* is of the first importance. This must depend on the nature of the disease, but the remedies generally serviceable are good nutritious diet, with plenty of milk; attention to all hygienic matters, with change of air, especially to the sea-side, sea-bathing being often very beneficial; regulation of the digestive functions; cod-liver oil, quinine, iron in some form, especially syrup of the iodide or phosphate, and other tonics. Iodide of potassium and liquor potassæ have been supposed to influence the size of the glands. It is the custom to use various applications over enlarged glands with the view of diminishing their size, especially ointments of iodine or iodide of lead; tincture of iodine painted over; lotions of iodine and iodide of potassium; spirit lotions, or those of muriate of ammonia; or sea-weed poultices or fomentations. In many instances undoubtedly much good may thus be effected, but certainly it is necessary to be careful in employing strong applications, such as strong iodine, and in practicing violent friction, as injurious irritation and inflammation are liable to be thus induced. Gentle friction with some simple oleaginous substance is frequently beneficial. Should abscesses form, they must be treated by poulticing and incisions. Symptoms due to enlarged glands in internal cavities must be treated as they arise. Extirpation of glands has been occasionally practiced, but this is not a desirable mode of treatment for many reasons.

CHAPTER LVII.

DISEASES OF THE THYROID GLAND—BRONCHOCELE—GOITRE.

THE cases of disease of the thyroid body which come under the notice of the physician belong to two distinct groups, which it will be necessary to notice separately.

1. In certain districts enlargement of the thyroid gland—*bronchocele* or *goitre*—is very prevalent, so as to become an endemic disease. It is particularly observed at the base of high mountains. In this country goitre prevails especially in Derbyshire—hence named "Derbyshire neck"—in certain parts of Yorkshire, Sussex, Hants, and Nottinghamshire. It has been attributed to many meteorological and other causes, but the mass of evidence goes to prove distinctly that it is due to *impregnation of the drinking-water with excess of lime and magnesia salts,* these having been dissolved in the percolation of the water through the geological strata containing them. The disease is observed most commonly in females, and is rare before puberty, though it has been known to be congenital.

ANATOMICAL CHARACTERS.—The degree of enlargement varies considerably, and the gland may attain very great dimensions. It begins in the isthmus or in one lobe, especially the right, but ultimately usually involves the entire organ. The shape is generally altered, the distinction of the several parts of the gland being lost, but not always. At first the tumor is soft, but gradually becomes firmer, and may ultimately be exceedingly hard. In the early stage there is simply hypertrophy of the gland—*simple bronchocele*—with formation of a glutinous, ropy, colloid fluid in its cells; afterwards the bloodvessels increase in number and become dilated, while numerous cysts form—*cystic bronchocele*—containing the gelatinous material or a bloody-looking fluid. Ultimately calcareous matter is deposited, and the gland may be converted into a calcified capsule, inclosing cysts, various kinds of fluid, calcareous aggregations, &c. Inflammation and suppuration or ulceration are liable to arise, altering much the characters of the enlargement.

SYMPTOMS.—The thyroid gland presents an obvious swelling. It may compress the neighboring structures, and lead to serious dyspnœa, dysphagia, or interference with the circulation in the neck. The general system is below par, there being often much debility and anæmia. In some valley districts bronchocele is associated with *cretinism*, a condition of marked mental deficiency, with atrophy of the brain and bodily deformity.

2. *Exophthalmic Goitre—Graves's* or *Basedow's Disease.*—This is a highly interesting complaint, characterized by *palpitation of the heart, marked pulsation in the vessels of the neck and head, enlargement and usually pulsation of the thyroid gland, and prominence of the eyeballs* or *exophthalmos.* It is observed by far most commonly in *young women*, but may be met with in males, who are usually somewhat advanced in age. Almost always, but not invariably, the condition is associated in females with marked anæmia and menstrual derangement. Pathologically it is believed to be the result of *paralysis of the vaso-motor nerves of the vessels of the heart, thyroid, and head and neck.* The enlargement of the thyroid, which is not usually very great, is due to dilatation of the vessels, serous infiltration of the tissues, and hypertrophy; very rarely do cysts form. The exophthalmos results from the eyes being pushed

forward, owing to increased vascularity, œdema, and probably hyperplasia of the fat behind them. There is no evidence for the notion that the nervous disturbance is due to any obvious change in the cervical ganglia of the sympathetic, as has been suggested.

SYMPTOMS.—As a rule the subjects of this affection are very anæmic or chlorotic. Palpitation has usually existed for some time before the other phenomena are noticed, and these generally come on very gradually. The enlarged thyroid pulsates or presents a peculiar thrilly sensation, and frequently a hæmic murmur is heard over it. The pulsation may be visible at a distance, and the carotids are often seen to throb violently. The degree of exophthalmos may become so great that the eyeballs project considerably, and the eyelids cannot cover them; hence grave destructive changes are liable to be set up in these organs. Their movements also may be much impaired. The exophthalmos is sometimes preceded by a spasmodic contraction of the levatores palpebrarum, said to be very characteristic. Uncomfortable sensations of throbbing, giddiness, and headache are often complained of. Many cases improve or recover under proper treatment. Death may result from the consequences of gradual dilatation and weakening of the heart.

TREATMENT.—In the first variety of bronchocele, the principles of treatment are to change the residence, avoid drinking the impregnated water, employ iodine both internally and externally, and improve the condition of the system by iron. Iodine has gained the reputation of being almost a specific, and the best mode of administration is to give the tincture in small doses with iodide of potassium freely diluted. Iodide of iron is also very useful. Externally applications of the tincture, iodine ointment, or ointment of iodide of mercury are chiefly employed. Pressure may be beneficial. If this treatment is unsuccessful, surgical interference is advocated, especially injection of the gland with some irritant, such as diluted iodine or tincture of steel; passage of a seton or wire through the tumor; ligature of the thyroid arteries; or finally extirpation of the enlarged organ.

For *exophthalmic goitre* the treatment is that of the general state, iron and other tonics, with nutritious digestible food, and careful attention to the hygienic conditions, being the chief remedies required. Digitalis is useful, on account of its influence upon the heart, and belladonna has also been found efficacious combined with iron. Ergot has been recommended, and also galvanism of the sympathetic in the neck. Care must be taken to prevent the eyes from becoming injured, and with this object the eyelids may be closed by means of a light bandage if necessary.

CHAPTER LVIII.

DISEASES OF THE NERVOUS SYSTEM.

CLINICAL CHARACTERS.—The clinical investigation of nervous affections is frequently very difficult, and there is no class of diseases in which a definite and systematic mode of examination is more required. Further, it is highly important to remember the anatomy and physiology of the nervous system, particularly as to the functions of the different parts of the central organs, and the distribution and functions of the nerves. The clinical phenomena to be inquired about are as follows:

1. *Morbid sensations in the head*, including headache, tenderness, sense of weight or heaviness, throbbing, heat, vertigo, or dizziness.

2. *Morbid sensations connected with the spine*, chiefly pain, tenderness, burning, and a peculiar sense of tightness round the body, as if it were encircled by a tight cord extending from the spine. As regards spinal pain, it is important to notice whether it is felt all along the spine or is localized; if it is constant or paroxysmal; if it shoots in any direction; and in some cases how it is influenced by walking, movements of the spinal column, percussion or kneading along the spine, concussion of the heels, and *the passage of ice or of a hot sponge along the spine.*

3. *Mental disturbance.*—It is impossible to indicate here all the possible derangements coming under this head (especially as observed in insanity, a subject which will not be treated of in this work), but their general character may be gathered from the following summary: *a.* Impaired consciousness, from mere stupor to absolute coma. *b.* Disorder of the intellectual faculties, including perception and apprehension, thought, reasoning, judgment, and memory. Under this would come the various forms of delirium, mental confusion, delusions, illusions, and hallucinations; or there may be mere failure or complete loss of one or all of the

mental powers. In some cases they are unnaturally acute. *c.* Alterations in the moral feelings and actions, manner of behavior, disposition, affections, spirits, and temper. *d.* Emotional disorder, as evidenced by the emotions being unduly excited or the reverse. *e.* Disturbance of speech as an intellectual act—*aphasia*. *f.* Disorder of sleep, including somnolence, insomnia, uneasy sleep with bad dreams, somnambulism and somniloquism.

4. *Subjective Disturbances of the Special Senses.*—*a. Vision.* The chief derangements of vision are *photophobia* or undue sensibility to light; subjective sensations of flashes of light (*photopsia*), iridic colors, sparks, muscæ volitantes or spectra; and defective sight, either dimness of vision to complete blindness, double vision or *diplopia*, or *hemiopia*, part of the field of vision being lost. *b. Hearing* may be affected, as shown by intolerance of sound, different degrees of deafness, or tinnitus aurium. *c. Smell* or *taste* may also be impaired or lost, unduly sensitive, or perverted.

5. *Alterations in General Sensation and Tactile Sensibility.*—These comprehend: *a. Hyperæsthesia*, or undue sensibility to touch, and *dysæsthesia* or *hyperalgesia*, or undue sensibility to pain. *b.* The opposite condition of *hypæsthesia*, *anæsthesia*, or *analgesia*. There may be a sensation of something intervening between the skin and any object touched, or inability to distinguish the characters of the surface or form of an object. *c.* Various kinds of pain and tenderness felt in different parts of the body. *d. Paræsthesiæ*, or perverted sensations, such as numbness, tickling, itching, formication or creeping, heat or cold, pricking, tingling, aura epileptica, &c.

6. *Impairment of the Muscular Sense.*—This probably exists in certain forms of disease, and is evidenced by a difficulty in realizing weight and resistance, or in performing certain muscular acts without looking and paying attention to them; or by a want of consciousness as to the condition of muscles, whether they are contracted or not.

7. *Alterations in Motility.*—These are of the greatest importance, and comprise: *a.* General restlessness and jactitation. *b.* Abnormal attitudes or movements while lying, sitting, standing, or moving, *e. g.*, being coiled up, boring the head into the pillow, disposition to stagger or fall, to advance irresistibly or run, rotate on an axis, or proceed in a circle. *c.* Evidences of muscular weakness, in the way of general trembling, local tremors, or unsteadiness of a limb when raised. *d.* Signs of undue muscular irritability, viz., twitchings, subsultus tendinum, rigidity, clonic or tonic spasms, convulsive movements, and cramps or painful spasms. As varieties of symptoms due to spasmodic movements should be mentioned strabismus, rolling about of the eyes, champing of the jaws, grinding of the teeth, and trismus or lock-jaw. *e.* Paralysis. This symptom will be presently considered at some length. *f.* Loss of power in co-ordinating

muscles for the performance of various acts. *g.* Automatic involuntary movements, such as those observed in chorea. *h.* Deficient or excessive reflex irritability. *i.* Cataleptic fixity of a limb, or slow, purposeless movements of flexion and extension.

8. *Changes in Nutrition and Secretion.*—The influence of the nervous system on these processes is well known, and as illustrations may be mentioned the wasting and tendency to bed-sores in paralyzed parts; the disorders of nutrition and secretion accompanying neuralgia; and the influence of nervous affections on the secretion of tears, saliva, urine, &c.

9. There are some important *extrinsic* symptoms often associated with nervous diseases, viz., those referable to the stomach, bladder, bowels, and sexual organs, many of them being due to paralysis. They include nausea and vomiting; obstinate constipation, accumulation of fæces in the rectum, involuntary or unconscious defecation; irritability of the bladder, retention or incontinence of urine, involuntary micturition; diminution or loss of sexual inclination or power, undue sexual excitability, or constant priapism.

10. *Physical Examination.*—Objective modes of examination are very useful in the investigation of nervous diseases, and the following outline may serve to indicate the information to be thus obtained:

a Examination of the head as to size, shape, state of the fontanelles, signs of tumors, &c.

b. Examination of the spinal column as to shape or evidences of a tumor.

c Tests of Tactile Sensibility.—In order to determine the state of cutaneous sensibility, the effects must be noted of a slight touch, pressure, tickling, pinching the skin, pricking, using Weber's, Sieveking's, or other instruments, and electricity. Weber's instrument consists essentially of a pair of compasses, the points of which are covered with sealing-wax, and it is noted what is the shortest distance apart at which these can be recognized as separate points of touch, an approximate idea being thus gained as to the degree of sensibility of a particular part.

d. Tests applied to Muscles.—When there is supposed muscular paralysis, it is necessary to desire the patient to attempt different actions which would bring the affected muscles into play, and thus observe whether they are really paralyzed, and to what degree; noting whether the actions can be performed at all, or if they are slowly produced and deficient in power. The same applies also when there is loss of co-ordinating power. A matter of frequent importance is to determine whether muscular irritability is retained or lost, as well as the degree of facility with which it is excited, and the force with which the muscles act. This is accomplished by employing some mechanical irritation, such as pressure, percussion, or drawing the finger along the muscles, but especially by electricity. In many cases also it is useful to note the effect of slight irritation of the skin in exciting reflex actions, as, for instance, tickling the soles of the feet in paraplegia.

e. Uses of Electricity.—Electricity has now come to occupy a most important position in the diagnosis, prognosis, and treatment of affections of the nervous system. It is, therefore, desirable to give a brief general summary here of the diagnostic aids which it affords, mainly gathered from Dr. Reynolds's lectures on the subject. A satisfactory knowledge of the many forms of apparatus employed, and of the modes of using them, can only be obtained from practical demonstration, and it must suffice to state here that one of three kinds of electricity is made use of in constructing the different appliances, viz.: 1. *Frictional*, *static*, or *Franklinic*. 2. *Galvanic* or *Voltaic*, which may be used as a *continuous* or *interrupted* current. 3. *Magneto-electric* or *Faradic*, the so-called *induced* current, from which only an *interrupted* current can be produced. The diagnostic value of these several forms is indicated in the following remarks:

(1.) In a case of supposed shamming of unconsciousness or "fits," much light may often be thrown upon it by giving the patient a tolerably strong shock, or touching parts of the face with one of the handles. Even where there is real unconsciousness, as in cases of alcoholic poisoning, the degree of this may be made out by noticing the effect of cautiously touching one of the features.

(2.) The most important use of electricity in diagnosis is to test—*a. The electric irritability* or *contractility of muscles*, *i. e.*, the *readiness* with which they contract; and *b.* The *force* with which they act. Either faradization or interrupted galvanism may be employed, and for determining the *irritability of muscles a very weak current* is necessary; for the *force*, *a strong* one. It commonly happens in paralysis that the *irritability* of the affected muscles is increased, these being brought into action by a much weaker current than those which are healthy; while, on the other hand, the *force of contraction* is greatly diminished, but little action being excited even by the strongest current. The information to be derived from this application of electricity is twofold—(i.) It may reveal whether a part supposed to be paralyzed is really in this condition or not, which is especially important in malingering, hysteria, and *after railway accidents.* For instance, should one side or one limb be stated to be paralyzed, if it is found that in the muscles here *irritability* is excessive as compared with the healthy side, while the *force of contraction* under a *powerful current* is greatly diminished, this gives certain evidence that paralysis exists. No *positive* conclusion can be arrived at if the irritability and force are normal, for this may be the case in true paralysis. (ii.) Suppose a part to be really paralyzed, electricity will reveal the relation of the muscles to the portion of the nerve-centre from which the nerve which supplies them comes. If the *electric irritability is permanently lost or more or less impaired*, it shows either that the part of the nerve-centre from which the nerve comes is itself disorganized; or that the nerve in some part of its course is destroyed completely or partially; or that there is some condition in the muscles themselves, or perhaps in the minute branches of nerve distributed to them, which prevents them from acting under electricity, as is especially the case in paralysis from lead, and in certain local forms resulting from exposure to cold In any case of paralysis the electric irritability may be temporarily impaired from mere disuse, but a few applications of the current will then speedily restore it. Should it be normal, this proves that there is no loss of continuity in the nerve supplying the muscles affected, and that the portion of the nerve-centre from which this arises is not destroyed. For instance, if the facial nerve is paralyzed from cerebral disease, which as a rule, does not affect its root of origin, the electric irritability of the facial muscles is but rarely lessened; but if the nerve is involved in some part of its course, as from ear-disease, then the irritability is always weakened or lost. In hemiplegia from cerebral disease, should the irritability of the affected limbs be permanently impaired, it proves that the disease has extended to those portions of the spinal cord from which their nerves actually arise. Again, in paralysis from disease of the spinal cord, if the contractility is normal, it shows that the disease is *higher* than the origin of the nerves and has not extended to this point, and *vice versa*. Dr. Marshall Hall used the term "spinal paralysis," to signify complete separation of a muscle from the spinal cord, whatever condition this may be due to. In certain forms of paralysis, viz., that from lead, local exposure to cold, and in anomalous cases of atrophic paralysis of the limbs, it is found that the electric irritability of the muscles is increased to a *slowly interrupted galvanic current*, while it is diminished or extinct to a *rapid current* and to *faradization*. By the employment of the *slow current*, improvement may be brought about, and as this takes place, the undue irritability diminishes, while it improves to the *rapid current* and *faradization*. Not uncommonly, after sudden paralysis muscular contractility becomes excessive after a few days; this indicates some irritation in connection with the brain or spinal cord, from increased vascularity, inflammation, or some other cause.

(3.) Another use of electricity is to *test the sensation which it produces in the skin*, *muscles*, *nerves*, and *nerve centres*. Reference need only be made here to the first two. The *general cutaneous sensibility* is often increased in hysterical and nervous persons. If it is excessive on one side, it is one sign, among others, of central irritation. In general shock and some cases of hysteria, trance, &c., the electric sensibility of the skin is lessened or absent, and also in some very rare cases of chronic central disease. It is often locally lost or impaired in connection with paralysis of a sensory or mixed nerve. *Muscular sensibility* is, as a rule, in proportion to the *contractility*. Occasionally, however, sensibility is lessened or extinct when contractility is normal, as in some cases of hysteria; and the reverse has been observed in certain instances of lead palsy. Sometimes also there is increased muscular sensibility while contractility is natural, as in myalgia and in rare cases of central disease. If contractility, with muscular and cutaneous sensibility, are all impaired in a limb or in one-half of the body, the condition is one of shock or of extensive cerebro-spinal lesion.

f. When a limb is paralyzed, the *state of nutrition* of the tissues must be noted, especially that of the muscles, by feeling, and by making circular measurements, for which a special apparatus has been invented by Dr. Reynolds; also whether there is any local *change in temperature*, or in the *pulse*.

g. Examination directed to the Special Senses.—It may be requisite to test the sense of hearing, taste, or smell, but the most important matter coming under this head is the *examination of the eye and of vision.* This comprehends: (i.) *Examination of the pupils*, observing whether both are contracted or dilated; if they are equal or unequal; and if they act properly under light. (ii.) *Testing the sight* in various ways, particular attention being paid to the *field of vision* in all directions. (iii.) *Examination with the Ophthalmoscope.* This instrument has now come to occupy a most important position as a mode of investigation of diseases of the nervous system. For a full account of this subject, and of the various kinds of apparatus employed, with the methods of using them, reference must be made to special works. The writings of Dr. Clifford Allbutt give much valuable information, and from these most of what follows has been gathered. It is, however, by practical demonstration that the use of the ophthalmoscope is best learned, and considerable personal practice with the instrument is required before it can be satisfactorily employed. In the succeeding remarks, a brief description will be given of the morbid appearances which may be presented, the structures to which attention must be directed being the optic disk, bloodvessels, retina and choroid.

α. Hyperæmia.—This may be limited to the vessels of the disk or retina, or involve both sets. It is characterized by more or less increased redness, enlargement of the vessels and apparent increase in their number, many radiating from the disk, and some appearing tortuous or varicose, there being in some cases little dark-red spots from localized dilatations. Pulsation in the vessels is often unusually distinct, especially on lightly pressing the eyeballs. Slight œdema of the disk may follow, dimming the edge, and veiling its surface. There may be subjective symptoms of dimness of vision, heaviness about the eyes, flashes of light, or iridic colors. The encephalic conditions with which hyperæmia may be associated are congestion, acute or chronic inflammations, especially meningeal, and tumors. *β. Anæmia.*—As a rule the disk, retina, and choroid are affected. There is pallor, with emptiness and shrinking of the vessels. It may be attended with temporary blindness, flashes of light or muscæ volitantes, and general weakness of vision. The local causes are vascular spasm and embolism. Anæmia has been noticed in epilepsy and acute uræmia. γ. *Œdema of the disk.*—Frequently accompanying other conditions, especially neuritis, in rare instances it exists alone. δ. *Ischæmia of the disk—choked disk.*—The opening in the sclerotic through which the optic nerve passes is an unyielding ring, and when there is any obstruction in connection with the cavernous sinus, preventing the return of blood by the ophthalmic vein, a strangulation is brought about at this aperture, which ultimately leads to serious changes in the disk. To this condition the term *ischæmia* is applied, which is described as being due to "obstruction at the cavernous sinus, with concurrent action of the sclerotic ring" (Allbutt). When advanced, the appearances in ischæmia are as follows: The disk is much swollen and prominent, generally rising steeply on one side and sinking gradually on the other, while the margin is obscured by infiltration and excessive vascularity, the latter giving it a mossy look, owing to the great increase in the number of capillaries. The color may be deep red, but is often a mixture of dirty gray and red, from the mixing of exudations with distended capillaries and minute extravasations. The nerve-fibres are somewhat swollen, less transparent than in health, so that the papillary region looks more coarsely fibrous. Cell and nuclear proliferation takes place in the neurilemma and sheaths of the vessels. The retina is only altered immediately around the disk, being opaque, its veins enlarged, with sometimes streaks of exudations along the larger of them. Some nerve-fibres are disintegrated. The trunk of the optic nerve is unaffected. This state frequently exists to a marked degree without any disturbance of central vision. The causes of ischæmia are meningitis, tumor, hydrocephalus, and caries of the sphenoid bone. ε. *Descending neuritis.*—Differing essentially from ischæmia, though the two states are often associated, *descending neuritis* signifies inflammation which has extended along the optic nerve from within the cranium, the extension probably chiefly taking place along its connective tissue. Hence the optic trunk itself is involved. The ophthalmoscopic distinctions from ischæmia are these: The disk is less swollen, and does not present the steep, one-sided elevation; the main trunks of the vessels are chiefly enlarged and tortuous, and there is not the great increase in number of the minute branches and capillaries observed in ischæmia; the color is less intense and more uniform, with more opacity, and these appearances extend further into the retina; there is often a "woolly" aspect, probably due to œdema. Numerous small hemorrhages frequently occur, which leave white spots. The intimate changes chiefly affect the connective tissue, which undergoes proliferation, the nerve-fibres being subsequently disintegrated and wasted. ζ. *Chronic optic neuritis—red softening.*—Here then is an early stage of redness of the disk, with in some cases hemorrhages and slight effusions, followed by consecutive atrophy, the vessels gradually contracting and disappearing. η. *Retinitis.*—Very rarely resulting from cerebral disease, this is characterized at first by hyperæmia of the disk and retina, followed by silvery patches of exudation upon the latter. θ. *Perineuritis.*—The outer neurilemma is most affected, and the appearances are mainly seen in the margin of the papilla, extending more widely into the retina than in other forms of neuritis. The intracranial causes of all the varieties of optic neuritis are meningitis and cerebritis, however these may be set up. The inflammation must be contiguous to the nerve, and the latter is more likely to be affected if it is severe or prolonged. Tumors and other morbid conditions may give rise to neuritis, but only indirectly, by first exciting inflammation of the cerebral structures. Chronic neuritis is said to be connected with abuse of tobacco, general paralysis, and locomotor ataxy. ι. *Atrophy of the Disk*—Two forms of atrophy are recognized, the *simple*, *progressive*, or *primary*; and the *consecutive*, which is *secondary* to ischæmia or neuritis. Dr. Hughlings Jackson distinguishes between them by the raggedness of the edges and blurring of the outline in the consecutive form; by the clean-cut even rim and more brilliant appearance in the primary form. Dr. Allbutt, however, considers that the condition described as simple atrophy often succeeds chronic neuritis, and that the ragged and irregular form is only transitional, gradual changes taking place in the products of inflammation, which are finally entirely removed. True *primary atrophy* may result from destruction of the fibres in the course of the optic nerve, so as to sever their distal ends from their central attachment, as by pressure of a tumor or inflammatory exudation; disease at the root of the nerve in the centres of vision; progressive sclerosis extending along it; or failure of nutrition from degeneration of arteries or embolism. The ultimate appearances in atrophy are that the disk becomes white, glistening, and more or less cupped, the smaller vessel fading away, the connective tissue being increased, and the nerve-elements disappearing.

h. There is a peculiar tendency among *malingerers* to sham nervous affections, and it sometimes requires considerable ingenuity to detect the imposture. In any case where anomalous nervous symptoms are complained of, without any objective signs, malingering should be suspected, and the patient should be closely watched, without letting it appear that this is being done. The tests to be applied will, of course, vary in different cases, but as illustrations may be mentioned the use of chloroform; various methods of detecting shammed fits, as putting snuff under the nose, applying heat or cold suddenly, pressing with the nail under the matrix of the thumb nail; supporting a supposed paralyzed limb in an extended position and letting it fall suddenly; pricking suddenly a part stated to be anæsthetic, while the patient is not looking; and the use of strong electricity.

i. In all cases of cerebral disorder, it is of great importance to examine carefully the *heart and vessels*, and also as to the *state of the urine*.

The more prominent symptoms connected with the nervous system will now be briefly considered.

HEAD SYMPTOMS.

HEADACHE OR CEPHALALGIA.—ETIOLOGY. The causes of this common symptom are very numerous, and terms are often applied to it indicating its mode of origin, such as congestive, plethoric, anæmic, organic, nervous or idiopathic, neuralgic, dyspeptic or bilious, &c. The pathological conditions which may give rise to headache are—1. *Disturbance in connection with the cerebral circulation*, either congestion, especially that due to general plethora, increased cardiac action, vaso-motor paralysis of the cerebral vessels (by inducing which many remote causes excite headache), or venous obstruction; deficiency of blood; or an abnormal condition of this fluid, particularly when it is hydræmic, imperfectly aerated, or impregnated with various deleterious ingredients. 2. *Injuries or organic diseases of the brain or its membranes, e. g.*, meningitis, cerebritis, abscess, tumor, softening, &c. 3. *Disease of the cranial bones, their sinuses, or of the structures forming the scalp.* 4. *Neuralgia*, affecting the nerves either within or outside the skull. Excluding local organic mischief, the chief remote causes which may excite headache by giving rise to one or more of the above conditions are, anything which causes general plethora or anæmia; cardiac or pulmonary diseases or fits of coughing; affections of the stomach, bowels, and liver; renal and cutaneous diseases; all fevers and acute inflammations; ague or mere malarial influence; gout and rheumatism; uterine disorders; hysteria; various causes which exhaust or depress the nervous and vital energy, as sedentary habits, deficient ventilation, especially overwork in confined rooms, undue mental exertion, depressing emotions, exposure to the hot sun, particularly when fatigued, loss of sleep, overlactation, venereal excesses and masturbation, abuse of coffee, tea, alcohol, tobacco, opium, and various other drugs which affect the brain. Some individuals are much more subject to headache than others, and especially delicate females of a nervous temperament.

The points which it may be necessary to inquire about with reference to headache are: *a.* Its mode of onset, and if it is brought on by any obvious cause. *b.* Whether it is constant or only felt at intervals. *c.* Its exact situation, whether general, unilateral, frontal, occipital, over the vertex, or localized to a spot; and also if it seems to be superficial or deep. *d.* Its characters, the chief varieties being heavy, dull, aching; throbbing; shooting or darting; boring; with sense of fulness; as if the head were going to burst; with feeling of great heat *e.* Its intensity, and if this is variable or not. *f.* The effects of movement and change of posture, especially moving or hanging down the head, muscular exertion, coughing, light or sound, firm pressure over the whole head or any part of it, taking food or stimulants, or pressure on the carotid arteries. *g.* If it is accompanied with soreness and tenderness over the scalp generally, or over any particular spot.

VERTIGO—GIDDINESS.—There are two distinct forms of giddiness, so far as the sensations of the patient are concerned, in the one the feeling being that of motion of the body, and as if it were impelled in different directions, accompanied with a tendency to fall and unsteadiness of gait; in the other extraneous objects appearing to move and to assume abnormal positions. The sensation is often described as "dizziness" or "swimmings." It varies much in intensity, and may be constant or paroxysmal. In many cases it is only or chiefly felt on movement or in certain positions, especially on hanging the head down. It may be worse when sitting, standing, or in the recumbent posture in different cases; closing the eyes, or staring fixedly for a time at an object has often a marked influence on vertigo, either aggravating or relieving the sensation. Occasionally an attack comes on during sleep, awakening the patient. Commonly other head symptoms are present, with disturbances of the special senses.

ETIOLOGY.—Vertigo is directly due to some condition in the brain which either causes it to receive wrong impressions from the special senses, especially that of sight, or interferes with the power of co-ordinating the muscles for movement. Probably there is in all cases some disorder of the cerebral circulation, either general or local, in the way of congestion, anæmia, or an abnormal condition of the blood. The causes of giddiness are either *centric* or *eccentric*, including mainly injury or organic disease of the brain or its membranes; *degenerative changes in the cerebral vessels;* certain functional nervous disorders, as epilepsy; movements influencing the cerebral circulation, such as swinging or waltzing; febrile conditions; exposure to paludal and other emanations; tobacco smoking; abuse of alcohol or narcotics; renal disease; gout; suppression of chronic cutaneous diseases; hemorrhages or discharges; anæmia; excessive mental and bodily work, especially if combined with close confinement, anxiety and worry, excitement, bad or irregular living; *digestive derangements;* organic or functional disorder of the heart, affecting the cerebral circulation, *especially a weak or fatty heart;* irritation of the special nerves of sense, such as a sudden strong light, bad odors, injection of water into the ear, or disease of the semicircular canals. Menière drew particular attention to ear affections as a cause of vertigo. Many of the eccentric causes are supposed to act in a reflex manner, probably influencing the circulation.

Certain forms of vertigo call for special notice. The *gastric* variety is described as occurring either in severe acute paroxysms coming on quite suddenly, often due to an undigested meal, and sometimes assuming a grave character, being accompanied almost with loss of consciousness; or as a milder chronic complaint, either constant or in frequent attacks. The digestive symptoms are not prominent in most of these cases. The vertigo is of both kinds, but consists chiefly of apparent movement of external objects. The chronic form is rendered worse by fasting, and is often relieved by a moderate meal or a little stimulant, also by shutting the eyes or gazing fixedly at some object. Dr. Ramskill describes what he terms *essential vertigo*, which is observed mostly in persons about 80 years of age, who do not complain of any other symptoms, but in whom there are signs of a weak heart and of a dilated right ventricle. He states that it is not materially improved by remedies, unless these are accompanied by rest and freedom from anxiety of every kind.

DELIRIUM.—This symptom implies an acute and temporary disorder of the mental faculties, which generally reveals itself in the language or actions. It varies in degree, from slight wandering and incoherence to the most complete and thorough derangement of the mental faculties Frequently there is a fixed delusion. When the delirium is slight, the patient can often be roused temporarily, so as to be tolerably coherent. It may be constant, but commonly tends to be worse by night, or may only come on then. In character the delirium may be mild and quiet: more or less wild and violent, the patient shouting furiously, or attempting to get out of bed or to injure those around; talkative and cheerful; surly; suspicious; low and muttering, when it is often attended with picking at the bedclothes or carphology. In many cases delirium is associated with more or less stupor.

ETIOLOGY.—Delirium may arise either from excitement or depression of the cerebral functions, being accordingly either active or passive. It is the gray matter covering the cerebral hemispheres which is specially affected. The causes of delirium are: 1. *Organic diseases* of the brain or its membranes, especially meningitis. 2. *Reflex disturbance* in connection with remote organs, as the stomach, bowels, uterus, particularly if attended with severe pain. 3. *A poisoned condition of the blood*, as in delirium tremens, acute febrile and inflammatory diseases, imperfect aeration of the blood, poisoning by belladonna and other substances. 4. *Nervous exhaustion*, as in delirium tremens (partly), after excessive venery, or undue mental exertion. 5. *Acute mania.* Some individuals are much more liable to delirium than others, and particularly children and nervous persons.

TREATMENT.—In order to relieve the head symptoms just considered, the point of first importance is to *find out the cause*, as treatment has in most cases to be directed against this, and must vary accordingly. In persons subject to headache or vertigo, attention to the diet, occupation, habits, and mode of life is frequently most essential. The various organs of the body must also be looked to, especially the digestive apparatus, heart, and kidneys. In many cases a course of vegetable or mineral tonics is highly serviceable. Arsenic proves very beneficial sometimes. When headache is merely temporary, associated with depressed nervous energy, stimulants will often relieve it, such as a little weak brandy and water, spirits of ammonia or chloroform, or a cup of strong coffee. Among local remedies which may be useful under various circumstances may be mentioned the use of cold, warm, or anodyne applications to the head; cold or warm affusion; sustained pressure around the head; sinapisms or blisters to the nape of the neck or some other part; and local removal of blood. Attention to posture may be of importance. As regards delirium, if it is of the active kind, and attended with much vascular excitement, the measures which may be needed are to shave the head, apply cold assiduously, use cold affusion, or remove blood. In other cases the aim of treatment should be to endeavor to procure sleep by means of some narcotic. Opium (which is sometimes usefully combined with tartar emetic or stimulants), hydrate of chloral, and full doses of bromide of potassium, often prove most serviceable. When delirium is of the low type, it is commonly an indication for the free use of stimulants. Warm affusion is often of much value in these cases. An important object to be always borne in mind is the removal out of the system of any deleterious materials which may be causing delirium. Of course due precautions must be taken, if necessary, against the patient injuring himself or others. All external sources of disturbance must be removed, and the patient kept as quiet as possible.

Insensibility—Stupor—Coma.

These terms imply more or less suspension of consciousness, depending directly on some condition of the brain, in complete coma there being absolute loss of sensation, perception, power of expression, and voluntary motion, or in other words, total abolition of the cerebral functions. In investigating this symptom, it is important to take into consideration—*a.* Its mode of onset, whether sudden or gradual, and if it is due to any obvious cause. *b.* Its degree, noting if there are any signs of sensation evinced, as by touching the conjunctiva, and also whether the patient can be roused temporarily or permanently. *c.* Whether it is but transitory or persistent.

Etiology.—It may be useful here to give a summary of the various causes of unconsciousness. Pathologically it may result from injury to or compression of the brain-substance; extreme cerebral congestion or anæmia; or the circulation through the brain of poisoned blood, or such as is inadequate to maintain its functions. The numerous causes may be arranged thus: 1. Local injury to the head and its consequences, as concussion, fracture of the skull, compression. 2. General shock, from injury, rupture of an internal organ, severe mental emotion, or any other cause. 3. Certain functional or nervous disorders, viz., epilepsy, hysteria, convulsions. 4. Diseases of the brain and its membranes, especially congestion, hemorrhage, effusions in connection with the membranes or ventricles, cerebritis and abscess, embolism or thrombosis, chronic softening, and some cases of tumor. 5. Blood-poisoning from morbid conditions within the system, as in uræmia, diabetes, certain cases of jaundice, low fevers. 6. Introduction of poisons from without, especially alcohol, opium, and other narcotics, prussic acid; also the inhalation of certain gases and vapors, as carbonic oxide or anhydride, hydric sulphide, chloroform or ether. 7. Syncope from any cause. 8. Asphyxial conditions. 9. As special forms may be mentioned the unconsciousness which follows prolonged exposure to cold, sunstroke, a stroke of lightning, or starvation. 10. It must not be forgotten that sudden insensibility is a favorite form of malingering.

TREATMENT.—The measures to be adopted when a person is insensible vary so materially according to the cause of this condition, that no uniform plan of treatment can be laid down. A few general hints may, however, be given regarding the management of the comatose state. The patient should be placed comfortably in the recumbent posture, with the head a little raised, all articles of clothing about the neck and chest being loosened, and plenty of fresh air admitted. If it is known or suspected that the coma is due to poison, or *even if there is much doubt as to the cause*, there ought to be no hesitation about using the stomach-pump, as it does no harm if properly employed, and may be most serviceable. If the insensibility depends upon blood-poisoning, as uræmia, means for promoting elimination, particularly by the skin, are highly valuable. In cases due to cerebral lesion, it is well not to interfere too actively at once. Among the measures which it may be necessary to have recourse to in order to rouse the patient, the chief are shaking and calling loudly; dashing cold water over the face and chest, or cold affusion; application of sinapisms to the nape of the neck and various other parts of the body; the use of electricity; the employment of stimulants, especially by enema; and artificial respiration. In certain cases it may be requisite to remove blood locally or by venesection. It is important to see that the limbs are kept warm in cases of prolonged unconsciousness, that the bladder and bowels are properly evacuated, and that the system is maintained by adequate nourishment, which may be administered by enemata.

CONVULSIONS.—ECLAMPSIA.

The spasmodic movements involved in the term "convulsions" vary considerably in their severity and extent, and as to the parts of the body affected. Thus they may be slight and localized, unilateral, or more or less general. Not uncommonly they are accompanied or followed by partial or complete loss of consciousness. Convulsions are most important in children, in whom a series of "convulsive fits" are liable to occur from very slight causes. They are frequently preceded by premonitory indications of nervous disturbance, such as twitchings, grinding of teeth, restlessness or peevishness, which should always be looked upon as a warning in the case of children. It is unnecessary to describe the distortion of the features and movements of the limbs and body which may result from the spasmodic movements, these being usually a combination of clonic and tonic, the former predominating. The chief dangers in convulsions are implication of the respiratory muscles or glottis, leading to grave interference with breathing; obstruction to the return of blood from the brain; and great exhaustion from extreme violence or frequent repetition of the fits, especially if they prevent sleep for a long period. Serious sequelæ may result from convulsions, such as hemiplegia, strabismus, loss of sight, smell, or hearing, defect of speech, or impairment of the mental faculties.

Etiology.—Convulsions are said to be due to "an abnormal discharge of unstable gray matter" (Jackson). They originate in some irritation, direct or indirect, affecting this gray matter. The main causes may be arranged thus: 1. *Centric. a. Injuries to the head, especially fracture with irritation of the gray matter by spiculæ. b. Various organic diseases* of the brain and cord or their membranes, as all forms of meningitis, cerebral hemorrhage, rupture of an aneurism, embolism, softening, tumor. *c. Idiopathic, dynamic,* or *essential.* Here the convulsions are independent of any obvious organic mischief, but are supposed to result from some vascular or nutritive disturbance in the brain, as in epilepsy, hysteria, or in convulsions produced by strong emotions. *d. Circulation of unhealthy blood through the central nervous system, e. g.*, the convulsions which in children usher in or occur during the course of acute specific fevers or inflammatory diseases (pneumonia, &c.); uræmic convulsions; and those which may be associated with imperfect aeration of the blood, or, it is said, rheumatic fever, jaundice, syphilis (independent of central organic disease), tuberculosis, and rickets. In the two conditions last mentioned, however, the nervous system is probably highly susceptible, and convulsive movements may be excited by very slight reflex disturbance. 2. *Eccentric, reflex,* or *sympathetic.* Here the convulsions are due to some reflex irritation, particularly in connection with dentition, digestive disorders, intestinal worms, the passage of a gallstone or a renal calculus. Occasionally they result from direct irritation of some local nerve, the pricking of a pin in the clothes of a child, application of a blister, or a burn of the skin. *Puerperal* convulsions are either uræmic or reflex.

The most favorable periods of life for convulsions, independent of organic disease, are childhood, especially during the periods of dentition, puberty, when cutting the wisdom teeth, and at the change of life. In children the common causes are reflex irritation; the onset of some acute fever or inflammation; tubercular meningitis; and the presence of some chronic constitutional illness. Later in life they are most frequently associated with epilepsy; organic affections of the central nervous system; and uræmia.

TREATMENT.—In treating convulsions the indications are: 1. To look for any reflex irritation and remove this if possible, particular attention being paid in the case of children to the teeth and alimentary canal, lancing the gums or giving an aperient or emetic if required, at the same time regulating the feeding. It is also well to examine the clothes, as the source of irritation may lie in them. 2. To treat any disease with which the convulsions are associated, such as rickets, tuberculosis, epilepsy, central organic disease, or blood-poisoning. 3. To mitigate or check the convulsive movements. During a paroxysm the recumbent posture, quiet, relaxation of the clothing about the neck and chest, and a free current of cool fresh air are needed. It is not advisable to restrain the movements except in so far as to prevent injury to the patient. Water may be sprinkled over the face and chest. If the convulsions continue, the warm bath containing mustard; ice to the head; warm pediluvia; cold or warm affusion; sinapisms to the nape of the neck, epigastrium, or extremities, are the chief remedial measures. Many resort at once to the application of leeches to the temples or back of the neck, or to venesection, especially in the case of robust children; but in most cases this is useless or injurious, and my own opinion is that, as a rule, removal of blood is only indicated when there are signs of serious interference with the respiratory functions. The principal medicinal remedies used are antispasmodics and narcotics, especially bromide of potassium, hyoscyamus, opium, hydrate of chloral, chloroform by inhalation, and assafœtida by enema. Of course most of these need caution in their employment. It is of the greatest importance to endeavor to procure sleep if this is much interfered with, particularly should there be much exhaustion. 4. To treat the effects. The chief dangers are from *suffocation* and *exhaustion*. For the former removal of blood and *artificial respiration* are indicated. To prevent or counteract exhaustion, it is extremely important to administer abundant liquid nourishment, especially in the case of weakly or badly fed children, and if it cannot be taken by the mouth enemata must be employed. Alcoholic stimulants are also most useful in many cases, being sometimes required in considerable quantities, along with medicinal stimulants, such as ammonia, ether, camphor, or musk. The administration of food and stimulants often promotes sleep most efficiently.

MUSCULAR PARALYSIS OR PALSY.

Motor paralysis is a symptom of the greatest importance in nervous diseases. Some of the main points to be noted with regard to it have already been indicated, and it is only needful further to remark, that particular attention must be paid to its mode of onset, whether sudden or gradual; its exact extent and distribution; its degree; whether it is permanent or temporary, constant or variable, or influenced materially by volition, emotion, or other causes; as well as to its subsequent progress, observing whether the paralysis tends to become worse, improve, or invade other muscles, and if any other phenomena arise in the affected part, especially clonic or tonic spasms, rigidity, or permanent flexion of joints. The tendency in many forms of persistent paralysis is towards imperfect nutrition of the tissues, as evidenced by softness and flabbiness of the muscles and other tissues, wasting and diminution of the circumference of a limb, dryness and scurfiness of the skin; and to feebleness of the circulation, the pulse becoming small and weak, the skin pale or blue and congested, the temperature lowered, while the affected part is much more influenced by the temperature of the surrounding medium than in health, and œdema sets in in some instances. Occasionally an extraordinary growth of hair is observed.

There are certain important *varieties* of paralysis, named according to its mode of distribution in the body, some of which it will now be requisite to consider briefly. They include: 1. *General paralysis*, which does not necessarily mean that every muscle in the body is affected, but is applied to that condition in which both arms and legs are paralyzed, with more or less of the trunk. 2. *Hemiplegia* or unilateral paralysis. 3. *Paraplegia* or paralysis of the lower extremities, the lower part of the trunk, with the bladder and rectum, being often involved at the same time. 4. *Disseminated or irregular paralysis*, when the paralysis is distributed in various parts of the body, as, for instance, in the arm and leg on opposite sides, or in the limbs on one side and the face or eye on the opposite. 5. *Local.* Where the palsy is limited to one limb or a part of it; to certain muscles supplied by a special nerve, as the facial, or associated in their action for a particular function; or even to a single muscle.

1. *General paralysis* is met with: 1. Rarely in cerebral diseases, viz., congestion (temporarily); hemorrhage into certain parts, as into the pons, both ventricles, or the meninges; and in some cases of tumor, extensive softening, or meningitis. 2. In disease or injury of the upper part of the spinal cord. 3. In the early stage of essential paralysis of children. 4. As a sequela of diphtheria. 5. In extreme progressive muscular atrophy. 6. In *general paralysis of the insane.* In this last disease the paralysis begins in the tongue, as shown by impaired articu-

lation with tremulous movements and a difficulty in protrusion. Next the muscles of the face quiver, especially the lips, while the pupils are often unequal. Then follows weakness of the limbs, with unsteadiness of gait, the patient stumbling and staggering on turning round suddenly, while the ability to perform various ordinary actions is impaired. More or less speedily, and usually by interrupted grades, the paralysis extends and increases until the patient becomes utterly helpless, is unable to swallow, food passing into the larynx, the pupils are unequally dilated, and urine and fæces escape involuntarily. Automatic and reflex movements also cease. The muscles do not waste much, as a rule, and they retain their electric irritability. During the progress of the paralysis twitchings and spasms are common. The muscular sense is much affected. Cutaneous sensibility is generally impaired and finally lost. Mental derangement usually precedes the paralysis; it may assume various types, but in most cases there is a brief melancholia, followed by a marked change in character, then incoherence, *with delusions as to personal importance and greatness*, the patient imagining himself to be extremely strong, wealthy, of high birth, or possessed of wonderful sexual powers. The ultimate condition is one of extreme dementia, the mind becoming a complete wreck.

2. *Hemiplegia.* In the majority of cases of one-sided paralysis, only the muscles of the arm, leg, trunk, lower part of the face, and tongue, are involved. In some cases there is a difficulty in wrinkling the forehead or closing the eye, or, on the other hand, the upper eyelid may drop. Speech is often affected, but usually *only in right hemiplegia.* If the paralysis is complete, the arm and leg are *quite helpless*, and in the recumbent posture the leg tends to rest on its outer side, with the toes everted. If it is partial, but still well marked, the gait is usually very peculiar. The patient leans towards the sound side, lifting up the opposite shoulder, and while the arm often hangs helplessly, the leg during progression is carried forward by describing a kind of outward swing or sweep, while the toes are directed downwards towards the ground. In less marked instances the leg merely drags, the toes, however, pointing downward, while the arm cannot be moved well, and the power of squeezing is diminished.

Not uncommonly partial restoration is effected in hemiplegia, which almost always commences in the leg, beginning above and extending downwards, *the muscles on the front of the leg being last restored.* The arm may remain for a long time or even permanently disabled. Generally there is no limitation of the reflex movements of respiration on the affected side, at least for some time; further, other reflex movements may be readily excited, sometimes even more easily than in health, while the paralyzed muscles of expression can in some instances be brought into play under the influence of strong emotion. Electric irritability is not impaired as a rule, except after long disuse of the muscles, and then it can be soon restored.

Etiology.—1. Hemiplegia is in the large majority of cases a sign of *organic cerebral mischief, the paralysis being on the side opposite to that of the disease.* The great centres of motion, viz., the corpus striatum or optic thalamus, must either directly or indirectly be interfered with, and probably hemiplegia may result from actual destruction, compression, congestion, or anæmia of this portion of the brain. The morbid conditions which thus give rise to hemiplegia are: *a.* Rarely congestion, it being then merely temporary. *b.* Hemorrhage most commonly. *c.* Embolism or thrombosis of a main artery. *d.* Acute cerebritis or softening, and abscess. *e.* Chronic softening from any cause. *f.* Cerebral tumor. *g.* Unilateral meningitis. 2. In very exceptional instances hemiplegia results from unilateral disease of the spinal cord. Of course there is then no facial paralysis. 3. Occasionally it is observed in connection with certain functional nervous diseases, apart from any evident organic lesion, viz., chorea, epilepsy, and hysteria. It may also be associated with parturition.

3. *Paraplegia.*—This varies much in degree and comes on either gradually or rapidly. When it is complete, the utter helplessness of the legs as the patient lies, or when made to attempt to stand supported, is very striking; in less advanced cases there is more or less weakness and difficulty in movement, with unsteadiness of gait, dragging of the feet, and stumbling while walking. Reflex movements are usually very easily excited. The condition of electric irritability varies.

Etiology.—1. Paraplegia is in the large majority of cases the result of *injury to* or *disease of the spinal cord.* Thus it may be due to—*a.* Fracture or dislocation of the spinal column, or wound or violent concussion of the cord. *b.* Compression of the cord by external tumors. *c.* Caries of the spine and its consequences. *d.* Congestion, when the paralysis is usually partial. *e.* Meningitis. *f.* Acute myelitis. *g.* Chronic softening. *h.* Hemorrhage into the cord. *i.* Tumor or parasites in its substance. 2. Sometimes paraplegia is a purely functional disorder, being met with in hysteria or as the effect of some powerful emotion, and also as a reflex phenomenon in connection with uterine affections, pregnancy, urinary diseases, dentition, or worms, and after exposure to cold and wet.

4. *Local and Special Paralysis.*—It is not intended here to describe the many varieties of local paralysis which may come under observation, but merely to point out their general causes, and to consider the chief facts relating to paralysis of certain special motor nerves.

Local palsy may be an indication of *slight* or *commencing central disease*, but in the majority of cases the cause is *peripheral*, either directly affecting one or more nerves or certain muscles. This peripheral paralysis may be due to—*a.* Destruction of a nerve from injury. *b.* Pressure by tumors, aneurism, or inflammatory thickenings; or mere temporary compression, as from long sitting or lying on the arm. *c.* Changes induced in the nerve itself, probably mostly inflammatory, from neighboring irritation, as that of necrosed bone or ulceration, exposure to cold, syphilis, rheumatism or gout. *d.* The entrance of certain poisons into the system, especially lead, or, it is said, malarial poison. *e.* Changes in the muscles, either atrophic or degenerative, as in progressive muscular atrophy. Local paralysis may be a sequela of *diphtheria*, and also of other febrile affections. It may further result from *local embolism*.

Facial Paralysis—Bell's Palsy.—Paralysis of either facial nerve, and consequently of one side of the face, is the most important local variety that occurs in practice, the entire nerve being then usually involved. The signs are as follows: There is a complete absence of expression on the affected side, which appears flattened and smooth, the features being blank and meaningless. The half of the mouth seems broader than the opposite, while the angle falls. Sometimes saliva flows from the mouth. The nasal aperture is diminished in size, on account of the ala falling in. The healthy side appears to be or is actually drawn away, and the angle of the mouth raised. The eyelids on the paralyzed side are unusually apart, the lower one dropping down, and as they cannot be closed the tears trickle down the cheeks, the corresponding nostril is dry, and the constant exposure of the dry eyeball soon leads to irritation of the conjunctiva, followed by serious injury to the deeper structures. It is, however, on attempting to bring the affected muscles into play that the most evident signs are afforded. The patient cannot smile, weep, wrinkle the forehead, elevate the eyebrow, frown, close the eyelids, knit the brows, or expose the teeth on the paralyzed side. Articulation of labial sounds is impaired, also the ability to whistle, while if the patient is directed to blow out the cheeks, the affected one flaps loosely. When masticated, the food tends to collect between the cheek and gums, while fluids often run out of the mouth; the power of spitting is impaired. If the facial nerve is implicated in a certain part of its course, other less obvious signs are said to be observed, dependent upon some of its branches being distributed to the tongue, salivary glands, and palate, viz., perversion of taste on one side, and occasionally slight drawing of the tongue to the same side; deficient secretion of saliva; relaxation and imperfect action of the velum palati on, and pointing of the uvula towards the affected side, with a somewhat nasal character of the voice.

It is of considerable importance to recognize in what part of its course the facial nerve is implicated, and to determine the cause of the mischief. The causes of *facial paralysis* may be summarized thus: 1. *Organic mischief in the brain.* 2. *Pressure upon the nerve within the skull after it has left the brain*, especially by various kinds of tumors and meningeal exudations. 3 *Injury or disease involving the nerve in its course through the* *temporal bone*, as from gunshot injury, or *necrosis of the petrous portion of bone*. 4. *Causes affecting the trunk or branches of the nerve after its exit from the stylo-mastoid foramen*, viz., injury, as from a cut or contusion; pressure by parotid and other tumors or enlarged glands; *direct exposure of the side of the face to a cold draught of air*, as in travelling by train with the window open; general exposure to cold and wet; gout, rheumatism, syphilis, or, it is said, malarial influence.

The *diagnosis* of the origin of facial paralysis rests on: 1. *The history of the case*, as revealing some of the causes just enumerated, and also the mode of onset of the paralysis, whether sudden or gradual. 2. *The other symptoms present.* Thus, when the paralysis is due to cerebral mischief, there are generally signs of this, such as hemiplegia and mental disturbance; if there is some intracranial pressure beyond the brain, headache and other local symptoms are commonly complained of, while other cranial nerves are frequently involved, and there is sometimes paralysis of the limbs on the opposite side. If the temporal bone is diseased, deafness and otorrhœa are usually present. If the nerve is affected outside the skull, some cause of pressure may be obvious: there may be no symptoms whatever except the paralysis; or the sensory nerves of the face are sometimes affected as well, in the direction of neuralgia or anæsthesia. 3. *The extent of the nerve involved.* In the case of paralysis from cerebral causes, it is only the lower part of the face which is as a rule prominently affected, the muscles of the eyelids and forehead either acting normally or being only slightly weakened. In all the other forms the whole side of the face is paralyzed. It is only when the nerve is implicated in its course through the temporal bone that the palate and tongue are affected. 4. *The state of electric irritability.* In cerebral paralysis it is retained, unless the disease is at the origin of the nerve; in all the other forms it is impaired or lost temporarily or permanently, except when due to cold, when there may be increased irritability to a *slow galvanic current*. 5. *The progress of the case and effects of treatment.* For instance, when due to tumor, injury, or bone-disease, the paralysis is generally persistent; after cold, rheumatism, or syphilis, it may often be cured by proper treatment.

In very rare instances *double facial paralysis* is observed, but it is difficult to recognize. It may be due to centric disease, especially hemorrhage into the pons, or, it is said, disease of the nerves from exposure to cold, rheumatism, or syphilis.

Paralysis in connection with the Eye.—The nerves to be considered here are the *third, fourth*, and *sixth*. Complete paralysis of the *third* is indicated by ptosis or dropping of the upper eyelid, with inability to raise it; permanent external strabismus; dilatation of the pupil; and a difficulty in adapting the eye to vision at different distances. In some cases there is only ptosis when the paralysis is peripheral in its origin. The cause may be centric disease, pressure upon the nerve in its course, or exposure to cold, rheumatism, &c. When the *fourth* nerve is paralyzed, the superior oblique muscle cannot act. Paralysis of the *sixth* is evidenced by persistent internal strabismus. These forms of paralysis are generally associated with some pressure in the course of the nerves, especially by a tumor or meningeal exudation. Sometimes all the nerves of the eye are affected together.

Paralysis of the Tongue.—As a rule, unilateral paralysis of the tongue, dependent upon implication of the *hypoglossal* nerve, is a part of hemiplegia. The signs are—a widening of the tongue on the affected side; difficulty in movement and protrusion; deviation of the tongue to the *sound side when in the mouth, to the paralyzed side when protruded;* and impaired articulation. The entire tongue may be paralyzed, rendering articulation impossible, and deglutition very difficult.

It will be convenient here to make a few remarks with regard to *aphasia* or *aphemia*, terms which are now in frequent use, and the meaning of which it is requisite to understand. A person may not be able to make a proper use of articulate language from three distinct sets of causes: 1. There may be mental incapacity and loss of intellectual power, so that no ideas are originated in the mind which the individual wishes to convey. 2. The intellect may be intact, or at least not so impaired as to prevent the formation of ideas, but the patient cannot recollect the words requisite to express his thoughts, or cannot arrange them in a proper manner. 3. There may be merely a difficulty in the *mechanical* act of articulation, owing to paralysis of the parts necessary for this act, as the tongue, lips, and palate, the power of thought and also of expression, as evidenced by ability to write sensibly, being perfectly natural. It is to the second of these conditions that the terms *aphasia* or *aphemia* are strictly applied, viz., *where articulate language is interfered with as an intellectual act.* The degree of impairment varies widely in different cases. A distinction has been made between the *amnesic* variety of aphasia, in which there is *a loss of memory of words*, and the *ataxic*, in which there is a presumed lesion of the *cerebral apparatus of co-ordination*, so that the words cannot be arranged. Some patients can read distinctly enough, but are unable to compose sentences for themselves, even so far as to answer the simplest question. Some merely repeat the same word or part of a word, or only unintelligible sounds; others apply wrong names to persons and things. With regard to writing, some patients are able to perform this act, others cannot do so at all, the last being generally the subjects of right hemiplegia. Those who can write occasionally write sense, frequently nonsense, but more frequently either unintelligible characters or distinct but unconnected words (Reynolds). As a rule, the mental condition in aphasia is more or less impaired, but the degree of impairment ranges from what is scarcely appreciable to complete loss of mental power.

Aphasia is in the large majority of cases associated with *right* hemiplegia, and the morbid condition which most frequently gives rise to it is *embolism of the left middle cerebral artery*, as was first pointed out by Dr. Hughlings Jackson. It may depend upon tumor, hemorrhage, softening, meningitis, and other lesions, and I have known it to occur temporarily from mere vaso-motor disturbance. As regards the localization of the lesion in the brain, many adopt the view of Broca, that the *second and third left frontal convolutions of the cerebrum* are the seat of the faculty of articulate language, and that these must be affected in aphasia. Others consider that there must be a lesion of some part of the corpus striatum, or of some motor nuclei or intercommunicating fibres in its neighborhood. Niemeyer explains the frequency of aphasia in connection with disease of the frontal lobes partly by the fact, that pressure acting on one side in this region is readily propagated to the opposite, so that the brain is bilaterally affected.

Paralysis of the pharynx is mainly indicated by great difficulty or impossibility of swallowing and thickness of speech. When the *inferior maxillary* nerve is involved, the *muscles of mastication* are paralyzed. The signs of *paralysis of the larynx* have been considered in a former chapter. Those of *paralysis of the bladder* and *rectum* have also been pointed out

TREATMENT.—The objects to be aimed at in treating paralysis of any part are to restore it to its normal activity as speedily as possible, if this is practicable; and to counteract the tendency to those atrophic and other changes to which it is liable. Of course the measures to be adopted must first of all have reference to the *cause* of the paralysis, by removing which restoration is often rapidly and completely effected. As illustrations may be mentioned the use of iodide of potassium in cases due to syphilis or lead. In many forms of paralysis *time* is a most important element in treatment, and much harm may be done in not a few instances by interfering too actively or too soon. It is requisite to see that a paralyzed part is properly covered with warm clothing, and that it is kept clean. The chief local measures employed against palsy are systematic passive motion of joints, which may be combined with efforts at voluntary movements; various baths and douches, either hot or cold; friction, either with the hand alone, with flesh brushes or gloves, or with some stimulant liniment; shampooing; and electricity, which also may be carefully combined with attempts to move the muscles voluntarily. The employment of electricity in cases of paralysis demands special notice, and it will be convenient here to give a brief summary of the main facts pertaining to this subject, which I have again derived from Dr. Reynolds's work. Much discrimination and caution are needed in resorting to this agent, as it is very powerful for evil as well as for good. The beneficial results which electricity is capable of effecting in paralysis are these: 1.

Restoration of the functions of a muscle or nerve when its activity is impaired, and thus possibly restoration of voluntary movement. 2. Prevention of wasting of the muscles, and thus arrest of the progress of a case. 3. Increase in the vascularity of a part, thus removing coldness, blueness, and other signs of feeble circulation. 4. Improvement in the nutrition of the muscles, nerves, and other structures, if they are atrophied or ill-nourished. 5. Prevention, retardation, or removal of spasmodic contractions and rigidity. 6. Probably its long-continued use may improve the nutrition of the part of the nerve-centre from which the nerve which supplies the affected muscles originates. The kind of electricity required varies in different cases, but it may be stated as a rule, that for promoting the action of muscles *faradization* and the *interrupted galvanic current* are most useful, though *franklinic electricity* is occasionally more beneficial than either; that for improving the circulation and nutrition, the *continuous galvanic* current or *faradization* by means of a metallic brush acts best; whilst to oppose the overaction involved in spasmodic movements and rigidity (and this applies to these conditions under all circumstances) *a weak constant galvanic current* or *very rapidly interrupted faradization* may be applied to the affected muscles; or in certain conditions of rigidity, the use of *faradization* or *interrupted galvanism* to the *antagonistic* muscles is most efficacious.

A few general hints as to the employment of electricity in treating paralysis may be serviceable. Care must be taken not to frighten the patient. The current used must not be so strong as to cause pain, or, on the other hand, so weak as to be useless, and the application should be brief, so as not to tire the patient or the muscles. It may be repeated twice a day, daily, or every other day, according to circumstances. In employing *galvanism*, one handle, containing a sponge of sufficient size and well wetted, must be kept fixed in one spot, as over the shoulder or in the bend of the elbow in the case of the upper extremity, and the other drawn slowly along the muscles in turn. With *faradization* the two poles must be kept *near together*, and it is almost always best to hold both in *one* hand, and draw them along each muscle. More action is excited at certain spots, which generally correspond to the points where the nerves entering the muscles are most superficial. In treating paralysis of a special nerve, one handle must be placed over the trunk of the nerve, and the other moved about or not, according as galvanism or faradization is employed.

Some observations will now be offered on the uses of electricity in the chief varieties of paralysis.

1. *Cerebral.* In cases of *sudden* cerebral paralysis, *electricity must not be used at all for some time*, even for purposes of diagnosis or prognosis, and the greatest care is necessary for a long period. Even if it has been gradual in its onset, caution is necessary should there be head-symptoms,

as headache, sense of weight, or giddiness. Much improvement may be effected in other cases in the various directions already indicated; but so far as the paralysis itself is concerned, the value of electricity will depend on the *degree of contractility shown by the muscles on its first application.* If this is normal or nearly so, the power of voluntary movement can be but slightly if at all increased. If it is much diminished from want of use, much good may be done by reviving the contractility of the muscles, but once this has become normal no further improvement as regards voluntary motion can be effected by electricity.

2. *Spinal.*—If the muscles act readily under electricity in cases of *complete spinal paralysis*, the power of voluntary movement in the limbs cannot be increased by its use, but sometimes the functions of the bladder, rectum, or sexual organs may be much improved by its local application to the anus or perineum. If the *paralysis is partial* and *contractility is impaired*, much good may be done up to the point of restoring the contractility; electricity must not, however, be employed in *acute* cases of this kind, but it is of the greatest value in those which have set in slowly. If there is atrophy of the limbs, *galvanism* is most efficacious; if none, *faradization*. Should there be the complete "spinal paralysis" of Marshall Hall, electricity cannot improve the power of movement, and if no sign of contractility is observed after a few applications, it is useless to go on with it; if the contractility is merely impaired much good may often be effected. In cases of "infantile paralysis" due to spinal disease, the use of the *slowly interrupted galvanic current* frequently proves very serviceable for a time when other forms of electricity fail, but as the muscles improve in their action *faradization* becomes efficacious.

3. *Local.*—Should a nerve be completely destroyed in its course and electric contractility quite gone, no improvement can be effected by electricity, In some cases, however, the morbid changes in the nerve disappear, but more or less paralysis persists from want of use. Here electricity is of great service, and it will be well in such cases to continue its application for some time, provided any contraction can be excited. In certain cases of local paralysis from lead, cold, &c., the use of a *slow galvanic current* has most effect upon the muscles, as previously explained. Here, therefore, this should be used at first, and a gradual change made to faradization as improvement is brought about.

A few words are needed as to the treatment of *facial paralysis from cold.* The application of heat and moisture constantly, leeching, and steaming are the measures recommended at first; followed by blistering, friction with stimulating liniments, and the use of a *slow galvanic current.* Quinine and strychnine are useful in some cases.

NEURALGIA.

Neuralgia or *nervous pain* is a comprehensive term applied to certain painful affections occurring in different parts of the body, the pain appearing to follow the distribution of particular nerves and having special characters. It will be convenient first to consider the general etiology, pathology, and clinical features of the complaint, and then to allude briefly to its principal varieties.

Etiology and Pathology.—In a large proportion of cases neuralgia is distinctly dependent upon some *general* or *constitutional condition.* The causes which may give rise to such a condition are: 1. Exposure to malaria. 2. The presence of certain metallic poisons in the system, as lead, mercury, or copper. 3. Anything which induces anæmia or general malnutrition and debility. 4. Various causes which lead to depression and weakness of the nervous system, as prolonged worry and anxiety, undue mental exertion, strong emotion, general concussion of the nervous system, as from a railway collision, hysteria, excessive fatigue, exposure to heat, ennui and luxurious habits, excessive venery. 5. Degenerative changes associated with the decay of life, and those which precede the onset of locomotor ataxy. 6. Rheumatism, gout, syphilis, or exposure to cold and wet. In the cases last mentioned, however, neuralgia is probably mostly the result of inflammatory and other changes in the nerve itself, or of pressure by surrounding thickenings of fibrous membranes or by deposits.

An important group of causes of neuralgia are *local,* including: 1. *Injury* to a nerve in some part of its course, as from contusion, wound by a needle, partial section, the lodgment of a foreign body, as a piece of glass, when the pain may be in some *distant* nerve. When a nerve is completely cut across, either itself or some other nerve related to it now and then becomes subsequently the seat of neuralgia. 2. *Pressure, e. g.,* by foreign bodies, such as a bullet, cicatricial thickenings, old adhesions, neuromata, tumors, aneurisms, enlarged glands, callus uniting fractured bones, congested veins, or from long sitting, tight boots, hanging the arm over a chair. 3. *Irritation* of a nerve by necrosed bone, especially when it passes through a foramen or canal in this condition, carious teeth, surrounding inflammation or ulceration, or direct exposure to a cold draught. Even when neuralgia is *local* in its origin, its occurrence is greatly influenced by the *general* state of the system, and Anstie goes so far as to affirm, "It is universally the case that the existing condition of the patient at the time of the first onset of the disease is one of debility, either general or special." Among other *predisposing causes* may be mentioned the female sex; certain periods of life, especially that of sexual development, and about or beyond middle age; hereditary tendency to nervous affections; and a nervous temperament. An acute attack is predisposed to or intensified by fatigue or any other lowering influence. It may come on quite spontaneously, or be brought about by mental disturbances, pressure, cold, heat, overexercise, and numerous other influences.

Pathologically neuralgia may be connected with some evident morbid change in the nerve or nerve-centre, but as a rule there is no such obvious change. Probably there is in some cases more or less congestion or inflammation. Marked atrophy with degeneration of a nerve has been found in connection with neuralgia from pressure, occasionally so advanced as almost to render sensation extinct. Anstie writes, "I think it most probable that in *all* cases of neuralgia there is either atrophy, or a tendency to it, in the posterior or sensory root of the painful nerve, or in the central gray matter with which it comes in closest connection."

SYMPTOMS.—*Pain* is the essential symptom of neuralgia. The important characters of this pain are as follows: 1. It is almost invariably unilateral. 2. In recent cases it is distinctly intermittent, coming on in more or less sudden paroxysms, usually at irregular intervals, but occasionally at regular periods, especially in malarial cases; later on it is only more or less remittent. 3. The pain during the paroxysms is generally very severe, in some cases most excruciating, being described by such terms as stabbing, piercing, boring, burning, or screwing, also shooting from a point along some of the branches of the nerve affected, but rarely all; the darts, twinges, or "tics," in some instances come on with the suddenness of an electric shock, giving rise to intolerable agony. The pain may extend to contiguous or even distant nerves. Frequently strong pressure over the chief point affords relief; in other cases gentle friction does this; in others, however, there is exquisite tenderness. This paroxysmal pain often ends as abruptly as it commenced, with a sense of extreme relief and comfort. The pain in the intervals is much less severe, of dull or aching character, and in the superficial neuralgias presents *circumscribed points of tenderness*, "points douloureux," corresponding to the exit of branches of the nerve through bony foramina or openings in fibrous membranes, though they appear to the patient to be more diffused than these, in some cases giving the sensation of tolerably extensive contusions. It is not practicable in a treatise like this to indicate the seat of all the tender spots noticed in the different local neuralgias, but a knowledge of the distribution of the nerve affected and of the points at which its branches become superficial, will enable their situation to be recognized.

There are certain general facts to which it is desirable to allude. When neuralgia is local in its origin, the pain sets in more gradually as a rule, is more constant, and less capable of relief. In advanced age neuralgia is usually very severe and intractable, the points of tenderness being often intensely painful. Once an attack has happened, there is always a liability to its recurrence, and one may come on at regular periods. An individual may have had neuralgia when young, and then be quite free from it for many years, but be again subject to it at a later period of life. Different nerves may be implicated in different attacks, or even during the same.

Some interesting *complications* are often associated with neuralgia, affecting sensation, motion, the state of the vessels, nutrition, and secretion. The chief of these described include local hyperæsthesia, hypæsthesia, or paræsthesiæ, as numbness, tingling, or formication; disturbances of the special senses, especially sight; spasmodic twitchings, tonic spasms, convulsive movements, or even local paralysis; pallor, followed by redness of the skin, pulsation of the arteries, increase in temperature, and swelling of the affected part, with subcutaneous œdema; hypertrophy or atrophy of the tissues in prolonged cases, or increase of adipose tissue; increased firmness, falling off or whitening of the hair; the breaking out of skin eruptions, *e. g.*, herpes zoster, acne; increased vascularity of the conjunctiva, conjunctivitis, iritis, and other morbid conditions of the eye; periostitis; swelling or unilateral furring of the tongue; erysipelatoid inflammation of the tissues to which the affected nerve is distributed; impaired gastric secretion; increased flow of saliva or tears; local increase of perspiration.

VARIETIES.—Neuralgias are primarily divided into—I. *Visceral*, including *a. Cardiac; b. Hepatic; c. Gastric; d. Peri-uterine and Ovarian; e. Testicular; f. Renal.* II. *Superficial*, viz., *a. Tic-douloureux; b. Hemicrania* or *Migraine; c. Cervico-occipital; d. Cervico-brachial; e. Intercostal; f. Mastodynia or irritable breast; g. Lumbo-abdominal; h. Sciatica; i. Crural.* The visceral group will not be further alluded to, some of them having been already considered under their respective organs. The names applied to the superficial group will indicate their respective localities, but a few of them need special comment.

Tic-douloureux—Brow-ague—Prosopalgia.—This is one of the most common forms of neuralgia, the 5th or trigeminal nerve being involved. Rarely are all the divisions implicated, and it is the ophthalmic branch which is most frequently affected, the pain, therefore, being chiefly above the orbit and about the temple. Numerous points of tenderness are described, but especially the *supraorbital* and *parietal*, the latter being just above the parietal eminence, and corresponding to the inosculation of several branches. A variety of this neuralgia is named *clavus hystericus*, in which there is extreme pain, as if a nail were being driven into one or more spots, usually corresponding to the supraorbital or parietal points.

Hemicrania—Migraine or Megrim—Sick-headache.—Considerable attention has been paid of late to the complaint recognized by the above names. It will be convenient to treat of it here, as it is considered by many pathologists a form of neuralgia, though there is by no means a unanimity of opinion as to its nature. Most authorities regard it as being quite independent of any morbid state of the alimentary canal, and as essentially a nervous affection. Dr. Allbutt, however, considers that derangements of the abdominal viscera have an important influence in giving rise to migraine. The chief views as to the pathology of this malady are as follows: 1. That it is a form of *neuralgia of the ophthalmic or occipital nerve*, or of the *filaments distributed to the dura mater*. Some regard this neuralgia as merely due to peripheral causes, but Anstie, who is strongly in favor of migraine being a form of trigeminal neuralgia, attributes this primarily to a morbid condition *at the root of the nerve in the medulla oblongata*, its central nucleus in this part being the seat of atrophic molecular irritation, which has an unusually strong tendency to communicate itself to the neighboring and closely connected nucleus of the vagus. 2. That the complaint is due to *vaso-motor disturbance affecting the vessels of the head*, through the sympathetic nerve. Dr. Latham considers that in the premonitory stage of sick-headache, the small arteries are contracted, owing to excitement of the vaso-motor nerves, which depends upon a weakening of the controlling power exercised over them by the cerebro-spinal system, this probably originating in the medulla oblongata. During the stage of headache it is supposed the nerves become paralyzed, and the vessels consequently dilated, and Latham is of opinion that this paralysis is the result of depression following the previous excitement. 3. Dr. Liveing has advanced the hypothesis, that the paroxysms of migraine are due to "nerve-storms, traversing more or less of the sensory tract from the optic thalami to the ganglia of the vagus, or else radiating in the same tract from a focus in the neighborhood of the quadrigeminal bodies."

Sick-headache is characterized by periodic attacks, which usually commence during the period of bodily development from 15 to 25, becoming more frequent and severe, as a rule, up to a certain time, but tending to diminish in frequency or even to cease altogether in advanced age, particularly after the change of life in women. The chief *predisposing causes* are the female sex, attacks being peculiarly liable to occur about the menstrual periods; hereditary tendency to migraine or various other neuroses; anæmia and general want of tone, and a nervous and excitable temperament A paroxysm often comes on without any obvious exciting cause, or it may follow errors in diet, exposure to the sun, breathing vitiated air, undue mental excitement or effort, fatigue especially with fasting, sexual indulgence, and various other causes which lead to physical or mental depression. Sometimes it results from some disturbance affecting the sight or hearing.

An attack is generally ushered in by some premonitory symptoms, which are mostly observed when the patient wakes in the morning, such as a sense of depression, heaviness, or general uneasiness, vertigo, disturbed vision, especially a wavy glimmering, chilliness and shuddering, coldness of the hands and feet, tingling in the arm or tongue, irritability of temper, yawning, gaping, or sighing, disorder of speech or hearing, disinclination for food with a slimy taste. Soon the pain commences and speedily becomes intense. Almost always it is unilateral, felt chiefly in the supraorbital region, or sometimes within the orbit, but it not uncommonly extends over the whole side of the head. The precise character of the pain varies much in different cases, but it is generally throbbing. Pressure on the carotid artery usually diminishes its intensity. There is increased heat, and in many cases redness of the conjunctiva is observed, with an excessive flow of tears. During the paroxysm the patient usually takes to bed, feels extremely depressed and low, dreads every disturbance, begs to be left at rest, and is especially sensitive to light and noise. The pulse is frequently slow and soft. The pupils are contracted. When the suffering reaches its height, nausea and bilious vomiting generally set in, aggravating the pain, but afterwards it gradually diminishes, and the patient usually falls asleep. Anstie remarks that this vomiting is not ordinarily remedial, but that it "merely indicates the lowest point of nervous depression." Vomiting may be directly beneficial, however, if there is much undigested food in the stomach. On awaking from sleep it is found as a rule that the pain has ceased, but there is frequently a little superficial tenderness for a day or two, and the patient feels out of sorts. The duration of an attack is very variable in different cases, but it does not commonly last more than 24 hours, though it may go on for two or three days or more.

Intercostal Neuralgia.—Here the pain is felt along the course of one or more intercostal nerves. Those on the left side, especially from the 6th to the 9th, are most frequently affected. There is a constant pain, mostly corresponding to the point of exit of the *lateral cutaneous* nerve, and increased by a deep inspiration or coughing, or sometimes by moving the arm. Shooting pains also occur at intervals, extending from the spine along the intercostal spaces, or from the lateral point backwards and forwards. Three very distinct "points douloureux" can generally be detected, viz., 1. *Vertebral.* 2. *Lateral*, opposite the lateral cutaneous branch. 3. *Sternal or epigastric*, where the anterior cutaneous nerve perforates. This variety of neuralgia is very common in anæmic and chlorotic females. It also precedes herpes zoster, and a very severe and obstinate form is liable to follow the latter in old people. For the diagnosis of this pain from that of pleurodynia or pleurisy, the condition of the patient, the want of connection of the pain with any excessive or prolonged use of the local muscles, of any marked exacerbation from their use, or relief from rest, the characters of the pain with the points of tenderness, and the results of physical examination, are generally quite satisfactory. The breaking out of herpes is pathognomonic.

Sciatica or Hip-gout is the name applied to neuralgia in the course of the branches of the sciatic and other nerves about the hip. Generally the pain is mainly seated in the back and outer part of the thigh, but it may be in various parts of the lower extremity, down to the leg or foot. There is generally a persistent and deep pain near the tuberosity of the ischium, which is increased paroxysmally, shooting up or down, either without any cause or as the consequence of pressure, movement, especially a sudden jerk, or even coughing. The patient is often obliged to walk very carefully, or may be unable to move. Local anomalies of sensation, convulsive movements, cramps, and partial paralysis are very common. Many cases are exceedingly severe and unyielding to treatment. The limb may waste from want of use.

The local causes which most frequently give rise to sciatica are long-continued sitting, exposure to a cold draught, as in using windy privies, and sitting on a cold or damp surface. Not unfrequently it is associated with gout or rheumatism.

Treatment.—The general principles of, and chief remedies employed in the treatment of superficial neuralgia will now be briefly considered. 1. Any *local cause of irritation* must be removed. In regard to this point a caution is necessary respecting "tic-douloureux." This complaint is often attributed to decayed teeth, and not unfrequently these are extracted one after another without any improvement resulting, for the simple reason that the neuralgia is not dependent upon this cause at all. 2. It is highly important in the case of those who are subject to neuralgia *to adopt means to prevent attacks*, by attending to diet and hygiene, wearing warm clothing, regulating the state of the alimentary canal, and, in short, promoting a state of good general health in every possible way, at the same time avoiding every cause which is likely to bring on a paroxysm. 3. Treatment directed to *the general state of the system or to some constitutional diathesis* is in a large proportion of cases of the highest importance. Radcliffe and Anstie have shown the great advantage of the use of fatty elements when nutrition is impaired, especially cod-liver oil or Devonshire cream. Iron in anæmic subjects; quinine in full doses, especially in malarial neuralgias; arsenic in the form of Fowler's solution; strychnine or nux vomica are among the most valuable remedies for neuralgia. In some instances valerianate and other salts of zinc, nitrate of silver, or phosphorus prove beneficial. Should the neuralgia be associated with gout, rheumatism, syphilis, or the presence of some metallic poison in the system, treatment directed against such a condition is essential. 4. An important class of remedies are those which have *a direct sedative effect on the nervous system*, including mainly opium or morphia; belladonna; extract of cannabis indica; hydrate of chloral; bromide of potassium; conium; atropin; tincture of aconite; veratria; and ammonic chloride in full doses. Of late two new drugs have been introduced, which are said to be very efficacious, viz., *eucalyptol*, which is an essential oil derived from the *Eucalyptus globulus*; and the tincture of *Gelsemium sempervirens*.

These medicines are either given by the mouth; applied to the affected part by means of plasters, liniments, ointments, or tinctures; or above all, some of them are introduced by *subcutaneous injection*, particularly *morphia* and *atropin*. They are not merely to be used for the temporary relief of pain, but are in many instances most important aids in bringing about a cure, *if employed systematically and regularly every day* for such a period as the case may require. In using subcutaneous injections, it is best to begin with a *very small* dose—not more than one-tenth to one-sixth gr. of morphia—and increase it as occasion requires, some cases needing large quantities in time. As a rule the injection need not be made at the seat of pain, but Anstie recommends that this should be done in advanced cases where there is much hyperæsthesia, and where there is reason to think that much thickening and hypertrophy exists about the nerve. If necessary the sensibility may be first blunted by the ether spray. The use of *alcohol* demands brief notice. There can be no doubt that the pain in neuralgia may often be temporarily lulled by its use, but from my experience of some cases it seems to me that we should hesitate in recommending it, as there is in this complaint a strong tendency on the part of the patient to be taking it very often and in increasing quantities, so that the foundation may be laid for serious habits of intemperance. 5. Certain *anodyne local applications* have been alluded to above, the most useful being liniment or plaster of belladonna, opium plaster, tincture of aconite, ointment of aconitin or veratria, and a liniment containing eucalyptol. Among other local remedies which may be serviceable are dry heat or heat with moisture, chloroform liniment, sinapisms, flying blisters, and light linear cauterization. In obstinate cases blistering and even stronger forms of counter-irritation are recommended. Cold is useful in some cases, in the form of ice or evaporating lotions, and I have found much benefit from the employment of the ether spray over the seat of pain for a few minutes three or four times daily. A most valuable local method of treatment now recognized is that by *electricity*. The *constant galvanic current* is decidedly the best as a rule, but sometimes faradization is beneficial, or merely charging the patient from a friction-machine, or afterwards taking a spark from the seat of pain. In employing galvanism it is necessary to have only a *very weak* current, especially about the head, carefully guarding against giving rise to unpleasant head symptoms; to apply it by well-wetted sponges in the direction of the nerve, the positive pole being placed over the seat of pain; and not to make the application for too long a time, but with frequent repetitions. Surgical interference has been had recourse to in very obstinate cases of neuralgia, the nerve being divided or a piece of it cut out. This treatment is rarely followed by any permanent good results.

It is necessary to make a few additional remarks respecting the treatment of *migraine*. During the premonitory stage of an attack, if this is evident, certain measures may be taken with the view of preventing or mitigating the subsequent headache. The patient should at once go into a quiet, darkened room, and lie down on the side on which the pain usually occurs, with the head low, the extremities being kept warm. Very many remedies have been recommended, but their usefulness probably differs in different cases. The most important are diffusible stimulants, as a little brandy or sherry and soda-water, champagne, or spirits of ammonia; a cup of simple strong tea or coffee; hydrate of chloral; tincture of cannabis indica; bromide of potassium; nitrate of ammonium; caffein, either internally or by subcutaneous injection; and the now fashionable *guarana* powder, which consists of the powdered seeds of the *Paulinia sorbilis*. This last drug is given in the dose of 10 to 15 grains, but there is much contradiction in the accounts of different observers as to its efficacy. The application of a weak continuous galvanic current is sometimes useful. Dr. Anstie recommends a warm foot-bath containing mustard, and to breathe the steam from this at the same time. In some cases the administration of an emetic, as sulphate of zinc, has been decidedly beneficial in my experience. Much relief often results from tightly binding the head with a wet bandage. Probably the steady application of ice or the cold douche might be serviceable in some cases. During the height of an attack it is best to leave the patient in perfect quiet, and not to give food or anything else. In the intervals many of the measures recommended for neuralgia in general are indicated, and among the most useful medicines are strychnine, arsenic, quinine, and bromide of potassium. Tincture of cannabis indica in doses of from 5 to 10 minims thrice daily has been found beneficial by several observers. It is requisite to attend to the state of the alimentary canal; also to avoid the causes which are likely to give rise to an attack of migraine.

SENSORY PARALYSIS—HYPÆSTHESIA. ANÆSTHESIA.

A very few remarks must suffice on this subject. Tactile sensibility may be more or less diminished or completely lost. The distribution of the paralysis presents the same variations as in the case of motor palsy, the two conditions being often combined, and the etiology is to a great extent similar. With regard to *hemiplegia*, it is found not uncommonly that the muscles are paralyzed when sensation is intact; or this may be impaired at first, but be afterwards speedily restored. In *paraplegia* both sensation and motion are in most cases affected. When a *local* nerve is paralyzed, if it is a compound one, sensation and motion will also be equally impaired. One of the best illustrations of paralysis of a purely sensory nerve is that of the *superior maxillary*, or its continuation the *infra-orbital*; sensation is then lost in the parts to which this nerve is distributed, and when the patient attempts to drink out of a glass or cup, a very curious feeling is experienced, as if the vessel were broken opposite the middle of the upper lip. Nutrition and secretion are frequently seriously interfered with when sensory nerves are paralyzed.

TREATMENT.—The general remarks made as to the treatment of paralysis of motion apply to that of sensation also. Local warmth, friction, and electricity may be useful. The latter must not be resorted to for some time in anæsthesia or hypæsthesia from cerebral causes, and even then only very cautiously; it does not often lead to much improvement in these cases. Faradization with a brush is best. Electricity is often very beneficial in various forms of sensory paralysis met with in hysteria, either faradization or franklinic electricity being employed, the latter by directing sparks on to the affected part, charging it and then drawing sparks, or applying a small charge from a Leyden vial. If sensibility is lost locally from destruction of a nerve, no good results from electricity. When motor and sensory paralysis are combined, electrical treatment of the former may improve the latter also. Particular care is necessary in cases of sensory paralysis, as regards cleanliness and avoidance of pressure.

CHAPTER LIX.

ON CERTAIN FUNCTIONAL NERVOUS DISEASES.

HYSTERIA AND ALLIED AFFECTIONS.

PATHOLOGY AND ETIOLOGY.—Hysteria is a very complex morbid condition, of the nature of which it is impossible to speak definitely. It is a nervous disorder, but its exact seat cannot be localized, though probably the brain is most disturbed. No characteristic pathological change has been discovered, but there is probably a nutritive derangement of the entire nervous system. The attempt to localize the primary disorder in the sympathetic ganglia, and to attribute the phenomena observed to vaso-motor disturbance, has no sufficient foundation.

Hysteria is infinitely more common among *females*, beginning usually from 15 to 18 or 20 years of age, but sometimes much earlier or later, and rarely only at the change of life. Young girls, old maids, widows, and childless married women are the most frequent subjects of the complaint, and its manifestations

ften cease after marriage. Fits of hysteria are more common
bout the menstrual periods. These facts have led many to con-
der the hysterical state as primarily connected with some *disturb-*
nce of the sexual organs or functions, which affects the nervous
ystem. It has been attributed to malpositions of the uterus,
ndue sexual excitement and unsatisfied desire, sexual excess,
nd disordered menstruation in the way of menorrhagia, amenor-
hœa, or dysmenorrhœa. That uterine and ovarian disturbances
o help greatly in exciting hysteria in a large number of instances
annot be doubted, but many eminent authorities deny that these
onstitute the essence of the complaint. Its frequency in women
due to the inherent conditions of their nervous system, often
ggravated by their mode of existence. This may be disordered
y many conditions, but the sexual functions assume an undue
rominence in the mind, and thus any disturbance in connection
ith them produces an exaggerated effect. In many cases of
ysteria there is nothing wrong about the generative organs or
nctions, while it occurs often enough in married women with
milies. The improvement which frequently takes place after
arriage may be accounted for by the change in habits, thoughts,
urposes, occupation, and general surroundings which this usually
nvolves.

Hysteria is in some instances distinctly due to *digestive disturb-*
nces, especially long-continued constipation with accumulation
f fæces. Causes referable to *the mode in which girls are brought up*
nd their general habits of life aid materially in its production,
uch as want of useful occupation, indolent and luxurious habits,
verpetting and spoiling, subjection to the petty worries of fash-
onable life, keeping late hours at parties, reading sentimental
ovels, &c. *Temperament* and *hereditary predisposition* to nervous
ffections may have some influence, but the latter may often be
xplained by the patient imitating a hysterical mother. In not
few cases hysteria results from *depressing influences*, such as
ong-continued anxiety or *grief*, *disappointed affection*, *overwork*
ith bad feeling and *improper hygienic conditions*. It may
epend upon some definite *chronic disease*, either local or general.
n some instances the *condition named hysterical* can only be
ttributed to wickedness and *perversity*.

The *hysterical state* is now and then observed in males, but infinitely rarely an actual *fit*. The subjects of it are usually from 35 to 50 years of age, and its causes are excessive venery or masturbation, overwork with long-continued worry and anxiety, excessive and prolonged mental labor, senile degeneration, or commencing chronic cerebral disease.

The *exciting cause* of the first *hysterical fit* is generally some powerful and sudden emotional disturbance, but this may be very slight if the patient has previously been in a state of mental restraint, with pent-up feelings, or has been subject to depressing influences for a considerable period. Subsequent paroxysms also are liable to arise from much less disturbance than that which brought on the first attack. Suppressed laughter may lead to very severe fits. Occasionally they result from physical disturbance, as an injury, loss of blood, or some acute illness.

SYMPTOMS.—It is impossible to give even an outline of all the varieties of clinical phenomena which may be presented in cases of hysteria. There is scarcely a complaint which may not be simulated. In most cases, however, the prominent features are an undue excitability of the emotions, with defect in the power of the will and intellect; alterations in the general cutaneous sensibility and in the special senses, usually in the direction of hyperæsthesia and dysæsthesia; and a tendency to involuntary muscular movements or other disturbance of the motor functions. It will be necessary to describe first the characters of certain paroxysms or "hysterical fits," and then point out some of the principal phenomena which may be noticed in the intervals.

Characters of an Hysterical Fit.—As a rule it occurs when other persons are present, and never comes on during sleep. The attack is not sudden, but gradually worked up to, the patient generally having time to place herself in a comfortable position and to adjust her dress; it is often preceded by sighing, sobbing, laughing, moaning, nonsensical talking, gesticulation, or a feeling of globus hystericus, but not by any peculiar cry. During the actual fit there is apparent unconsciousness, but this is not complete, as can be determined by touching the conjunctiva, while the patient generally knows what is going on around, and looks out from under her eyelids occasionally. Spasmodic movements occur, varying from slight twitchings in the limbs to powerful general convulsive movements or almost tetanic spasms. Patients often struggle violently, throw themselves about, while the thumb is frequently turned in and the hand clenched. During these movements, which may last only a few moments or for an indefinite time, with or without intermissions, there is no lividity of the face or other sign of interference with respiration. Breathing is noisy and irregular, while gurgling and spluttering sounds are frequently produced in the throat and mouth. The pupils are not dilated; in many cases slight internal strabismus is observed, and the eyes are turned up from time to time. The pulse is normal. There is no biting of the tongue, and rarely any foaming at the mouth. The paroxysm generally terminates with crying, laughing, sighing or yawning, and is followed by a feeling of exhaustion, but not as a rule by coma; though in rare instances the patient falls into a kind of prolonged trance. Frequently abundant eructations of gas take place, and there is often a copious discharge of pale, watery urine. Rarely an attack is followed by a state of *hysterical mania*, in which the patient is not responsible for her actions.

State in the Intervals.—The chief deviations observed may be considered as they affect the mental, sensory, and motor functions.

a. Mental. There is defect of will and mental power, while the emotional functions are not under proper control, being very readily excited and giving rise to exaggerated actions. Some patients say they cannot perform various acts, such as standing, walking, or speaking, which they do perfectly well when they forget themselves. Frequently the spirits fluctuate very rapidly and without cause, from morbid cheerfulness to despondency, and the hysterical patient sobs, sighs, cries, or laughs without any reason. Ideation and thought may be overactive in some respects, but the general intellectual vigor is much impaired. Many hysterical patients talk a great deal of nonsense. They have an exaggerated self-importance, seek attention from others, and are, as a rule, never so pleased as when they become objects of attraction or sympathy, or are creating a sensation, which accounts for "fasting-girls," trances, some cases of somnambulism, &c. Many are very restless, irritable, and impatient. Others, however, seem simply indifferent to all around, and remain melancholy, silent, motionless, and apathetic for long periods together, caring nothing about dress or anything else. In some cases a form of mania sets in. Hysterical patients are strongly disposed *to take to drinking in excess.*

b. Sensory. Commonly a condition of *general exaggerated sensibility, hyperæsthesia,* or *nervousness* exists, both as regards cutaneous sensation and the special senses, an unusually slight stimulus being recognized or producing an undue effect. Further, there is often a condition of *dysæsthesia* or painful sensation from slight irritation. This is evidenced chiefly by cutaneous tenderness in certain parts, sometimes intense, especially in the left side, along some part or the whole of the spine (slight pressure over which will often cause severe pains to shoot to distant parts), around the joints, and over the abdomen. The tenderness is greatly diminished by *taking off the patient's attention,* and it is *very superficial,* signs of suffering being elicited by a slight touch or a pinch of the skin, but not when steady and firm pressure is made, or when a joint is rudely jogged. Dysæsthesia from slight stimuli may also be evinced in connection with the special senses. Spontaneous pains are commonly complained of in various parts, of a more or less neuralgic character, frequently described as very intense, and being especially seated at the top or back of the head (here often assuming the characters of clavus hystericus), in the left side, back, over the sacrum or coccyx, and in the joints. Paræsthesiæ, such as formication, numbness, tingling, flashes of light, tinnitus aurium, a peculiar smell or taste, are also common. A curious sensation often complained of is that named *globus hystericus,* which is a feeling of constriction or of a "ball in the throat," either fixed there and giving the sensation of choking, the patient making all kinds of ineffectual efforts to get rid of it, or ascending upwards from the epigastrium or even lower. In exceptional cases, hypæsthesia or even complete anæsthesia of the skin and deeper structures, or of the special senses is observed. Cutaneous anæsthesia is generally limited in extent, and irregular in distribution, but may be hemiplegic or paraplegic. The temperature is occasionally reduced. The bladder or rectum may be affected, leading to great accumulation of urine or fæces, of which the patient is not aware.

c. Motor. Voluntary movements are generally defective, and the power of the will over the muscles is weakened, while all kinds of involuntary movements are exaggerated and very readily excited, viz., those due to emotions, ideas, sensations, reflex irritation, and organic causes. The hysterical patient starts suddenly from any slight disturbance, rushes about under the influence of some notion or other, and does various other silly things. Spasmodic movements or fixed rigidity of different muscles are not uncommonly observed, independently of the fits, while cramps are very common, as well as spasms of internal organs. Occasionally there is some form of motor paralysis; generally it follows an hysterical paroxysm, and is limited to one limb, or more often to a part of it, but it may be more or less hemiplegic, paraplegic, or even general in its distribution. As a rule, sensation is not impaired at the same time, the paralysis is incomplete, nutrition is not at all impaired, or only slightly after long duration of the paralysis, while electric irritability is unaffected, though electric sensibility may be lessened, and now and then both are diminished or lost. Sometimes rigid flexion of one or more joints is observed, difficult to overcome, which is evidently partly due to voluntary opposition by the patient, and when it is overcome the limb rapidly assumes its former position, sometimes flying back with a sudden spring. The paralysis is liable to rapid changes and may cease suddenly. Under chloroform it completely disappears and power is restored. As regards *hemiplegia,* important diagnostic marks are, that it is usually incomplete; that the tongue and face are rarely involved, though there may be ptosis; that the manner of walking is different from that of true hemiplegia, there being merely a dragging of the leg without any swinging movement, *and the toes being raised;* and when the patient is made to bend forwards the arm is held back. In *paraplegia* also the paralysis is rarely complete, and one leg is more affected, generally the left; movement of the limbs can often be well performed in the recumbent posture, but when an attempt is made to walk, the patient being well-supported on either side, all power seems to be gone, as well as control over the muscles, and she falls if the support is removed, but generally manages to recover herself suddenly when near the ground. The bladder and rectum are usually unaffected. *Aphonia* is a frequent symptom in hysterical patients, resulting from laryngeal paralysis. Here there is no alteration in the quality of the voice as a rule, but it becomes a mere whisper, and if the patient is asked to make an effort to speak, even the power of whispering may be lost. This aphonia often comes on and disappears with remarkable suddenness, especially under the influence of some strong emotion. A curious *enlargement of the abdomen* is observed sometimes, constituting the so-called "phantom tumor." It presents a symmetrical prominence in front, often of large size, with a constriction below the margin of the thorax and above the pubes. The enlargement is quite smooth and uniform, soft, very mobile as a whole from side to side, somewhat resonant but variable on percussion, and not painful. Vaginal examination reveals nothing, and *under chloroform the tumor immediately subsides*, returning again as the patient regains consciousness.

Generally a hysterical patient is out of health, often weak and anæmic. Among the numerous symptoms complained of are *digestive disturbances*, especially flatulence, borborygmi, copious eructations, cardialgia, depraved appetite and fulness after food, obstinate constipation, intestinal colic or gastralgia; *circulatory disorders*, many of them due to vaso-motor disturbance, as palpitation, tendency to syncope, epigastric pulsation, throbbing of vessels, coldness of the extremities, sudden flushing and heat of the face; *respiratory symptoms*, as sense of oppression in the chest, fits of hurried and labored breathing, sometimes assuming a very serious aspect, spasmodic, irritable, dry cough, of long duration, and having a peculiar squeaking, barking, or howling quality, hiccup, and spitting of blood; *irritability of the bladder*, with frequent micturition; *menstrual disorders*.

The exact grouping of the phenomena described is extremely variable in different cases, and also in the same case from time to time. The hysterical state may be permanent, or only break out at intervals.

It will be convenient here just to allude to certain nervous phenomena occasionally observed, which are as a rule functional, and may be classed with hysteria. These are: 1. *Catalepsy*, in which the will seems cut off from certain muscles, and whatever position the affected part, as a limb, is placed in, it will remain fixed thus for an indefinite time. It may or may not be accompanied with unconsciousness. Sensation is usually much impaired, and may be lost. This condition is sometimes associated with organic disease of the brain, or severe organic visceral disease. 2. *Trance.* Here the individual lies as if dead, being ghastly pale, circulation and respiration having almost ceased. Such persons have even been "laid out" as dead. 3. *Ecstasy,* in which visions are seen. Often this is combined with ridiculous dancing movements, as in connection with certain religious communities.

DIAGNOSIS.—Attention to the characters described as pertaining to a hysterical paroxysm, and the circumstances under which it arises, will enable it to be distinguished from all other "fits." In women, hysteria should always be remembered as an explanation of many of the ailments of which they complain. Among the important affections which it may simulate are diseases of the brain and spinal cord; disease of the spinal column; peritonitis; abdominal tumors; laryngitis; and diseases of joints. The general signs of hysteria; absence of pyrexia, or of the characteristic symptoms belonging to the several affections; *peculiar superficial nature of any pain or tenderness* present; characters of the different kinds of paralysis, as already described; and *use of chloroform,* will generally enable a satisfactory conclusion to be arrived at.

TREATMENT.—1. *Of a Hysterical Fit.*—But little interference is needed, as a rule. An important matter is to get rid of the numerous officious and sympathizing individuals who generally surround the patient. She should be treated firmly, but kindly, and an endeavor made to gain her confidence, first ascertaining, if possible, the cause of the fit. Care must be taken to avoid injury, and the clothes should be loosened about the neck and chest. If anything further is needed, affusion of cold water, ammonia to the nostrils, or closing firmly the nostrils and mouth for an instant, so that the patient cannot breathe, may be resorted to. In obstinate cases a moderate galvanic shock does no harm. If any medicine is needed, spirits of ammonia with valerian or assafœtida may be given.

2. *During the Intervals.*—The treatment of persistent and marked hysteria is often very difficult. Mental and moral guidance is most important, and the patient should be taught to look away from herself and her grievances, and to engage in some useful occupation. Any wrong habit must be rectified. Change of scene and associations, with travelling, are often very serviceable. Any cause of discomfort at home or elsewhere should be removed, if possible. General treatment directed to the state of the system and blood is often most beneficial, also attention to diet and to the state of the digestive organs. *On no account should hysterical patients be encouraged to take alcoholic stimulants.* Various symptoms often call for interference. Pains in different parts are best relieved by belladonna or opium plasters, or anodyne liniments; that in the joints by warm poultices or fomentations with laudanum sprinkled on. Hypodermic injection of morphia may be required. For restlessness and sleeplessness bromide of potassium is the best remedy. Paralysis must be treated by electricity, and rigidity counteracted by fixing the limbs in other positions by splints or other mechanical apparatus, and by movements. If necessary, chloroform may be used. This may also be employed to remove "phantom tumor." I have often found aphonia cured by a small blister across the larynx, or even a small belladonna plaster, these probably acting through the mind. If necessary, the vocal cords may be galvanized, or the patient charged with franklinic electricity, and sparks taken from over the larynx. It is questionable how far such drugs as assafœtida, valerian, &c., are useful in hysteria, when used as a means of cure, except in that they are very disagreeable; they are valuable, however, as antispasmodics.

HYPOCHONDRIASIS.

The affection thus named is in reality merely a mental condition characterized by inordinate attention on the part of the patient to his own real or supposed bodily ailments and sensations. Adult males of the better class who have no occupation are the usual subjects of the complaint, but it is not uncommon to meet with it among workingmen in out-patient hospital practice. As a rule, there has been some disease at the outset, especially digestive or biliary disorders, venereal disease, or some acute illness. In other instances the symptoms are quite imaginary. The precise sensations complained of vary much, of course, and they are liable to be changed from time to time, or new symptoms are added, for which the hypochondriac is always on the lookout. These patients generally present a healthy appearance, and sleep and perform their ordinary functions satisfactorily. They go the round of the "doctors," if they can afford it; take any amount of physic, which they want to be always changing, particularly trying any new remedy that comes up; are delighted to talk about their ailments, often making use of scientific terms; consult every medical work they can get hold of; and are much addicted to examining their pulse, tongue, urine, and stools. They are very particular about their food and drink, and often as to their dress and general "get-up." Hydropathic and similar establishments, as well as places famed for mineral waters, are favorite places of resort for hypochondriacs. The moral character and feelings towards friends are unaltered. These cases are always very difficult to improve, and frequently quite incurable. Ultimately they may become wretched misanthropes, and shut themselves up away from all society.

TREATMENT.—The main thing in treating hypochondriasis is, to try to get some control over them, and to make them believe in you, by investigating their case properly, and showing that you thoroughly understand it. They cannot be talked out of their ailments, but kind argument may often do much, and they should be urged to take their attention off themselves, and mingle in society, travel, or otherwise occupy themselves. Attention must be paid to bathing, exercise, and other modes of maintaining the health. The diet and state of the digestive organs should also be regulated. As to medicines, something has generally to be given, and the best thing is just to treat the prominent symptoms, taking care not to give anything that can do harm. It is often useful to send hypochondriacs to hydropathic institutions or mineral spas, chiefly on account of the change they experience, and the society they meet.

EPILEPSY—FALLING SICKNESS.

ETIOLOGY AND PATHOLOGY.—*Epileptiform seizures* may be observed in connection with various organic diseases of the brain or its membrane, *e. g.*, meningitis, hydrocephalus, tumor, embolism, softening, syphilitic disease; in different conditions of the skull or dura mater which lead to pressure upon or irritation of this organ, or in certain forms of blood-poisoning, such as uræmia and saturnism. Epilepsy, however, as a separate disease, is ranked as "functional," for although organic changes have been described in the brain, these are commonly absent, and when present, are probably rather the effects of repeated fits. One view as to the nature of epilepsy is, that it depends upon some nutritive change in the medulla oblongata, upper part of the cord, and vaso-motor centres, which leads to excessive and perverted action in these parts, inducing sudden contraction of the vessels of the brain and cord, as well as of those supplying the muscles of the face, pharynx, larynx, respiratory apparatus, and limbs, to which all the subsequent phenomena of a fit may be traced. Another is that a sudden discharge of nerve-force from an immense number of nerve-cells takes place at the beginning of a fit, and that this leads to shock. The remote causes to which epilepsy has been attributed are: 1. *Mental disturbance*, especially emotional, *e. g.*, sudden fright, prolonged grief or anxiety; also excessive mental work, and forcing the brain in childhood. 2. *Physical influences affecting the brain*, as a blow or fall on the head, or sunstroke. 3. *Some condition affecting the state of the blood and general system*, as syphilis, rheumatism, gout, acute specific diseases, pneumonia, pregnancy. 4. *Reflex irritation*, as from dentition, worms, uterine and ovarian disturbances, sexual excesses and masturbation. Great prominence has been given by some to sexual functions as a cause of epilepsy. 5. *Hereditary taint*. Undoubtedly this has an important influence in the causation of epilepsy, especially when it comes from the mother. In a considerable proportion of cases either it or some allied neurosis is prevalent in the family. Probably intemperance in the parents, syphilis, or a fright to the mother while the child is *in utero*, may be the means of inducing a congenital tendency to epilepsy. It is developed at an earlier age in hereditary cases. 6. *Idiopathic.* This term applies to cases in which no obvious cause can be made out. *Age* requires special notice as a *predisposing cause.* In the great majority of cases epilepsy is developed between 10 and 20 years of age, and especially at or about the period of puberty. Sex does not seem to have any particular influence. It rarely happens that any immediate exciting cause of a fit can be made out.

SYMPTOMS.—Attacks of epilepsy assume one of two forms, the typical characters, each of which it will be necessary to describe, are:

1. *Epilepsia mitior—Petit mal.*—This is characterized by sudden and complete loss of consciousness, coming on without any warning, lasting only for an instant, or at most for a few seconds, accompanied with slight pallor and subsequent duskiness of the face, loss of all expression, dilated pupils, and often, but not always, slight spasmodic movements, affecting the face, respiratory muscles or limbs. If the individual is speaking, he stops in the middle of a sentence, and generally appears to hold his breath. Voluntary movements cease, but automatic actions go on as a rule, *e. g.*, such as are necessary for standing, sitting, or riding. In some cases there is not absolute unconsciousness, and there may be a feeling of sudden vertigo—"vertige epileptique"—which causes the patient to cling to the nearest object. After the attack there is some mental confusion, lasting a few minutes, during which the patient says and does things which he afterwards forgets and denies. There may be a little squinting, or a feeling of choking. On recovery there is no remembrance of what has happened. These attacks may be preceded by an "aura epileptica," and they may be premonitory of severe epileptic seizures, or occur with them. They are frequently followed by serious mental changes, ending in dementia or mania.

2. *Epilepsia gravior—Haut mal.*—The advent of a fit of epilepsy is in a large proportion of cases indicated by premonitory symptoms, varying in duration from an instant to several hours or days. They present great variety, being either subjective or objective, and commonly of a nervous character, affecting the mental condition; general sensation or the special senses; the muscular

system, or the vaso-motor nerves. Sometimes they are extrinsic, vomiting, obstinate constipation, sallowness of the skin, fetid secretions, &c. The so-called "aura epileptica" requires a few words of special comment. It is a peculiar sensation, well known to the patient, which in many cases immediately precedes a fit, generally appearing to start from the distal end of a limb, especially the arm, and to run up towards the head, on reaching which part the seizure takes place. Sometimes it only extends from the elbow to the shoulder, or from the leg to the epigastrium, and it has been stated to pass from the testicle or uterus to the throat. It varies in exact character, but has been compared to a stream of cold or hot air, and is frequently not unpleasant. It is curious that its ascent may sometimes be stopped and the fit be prevented by pressure, which need not be sufficient to stop the circulation, and sometimes this will happen when the pressure is applied to the opposite arm.

Actual Attack.—Three marked stages characterize an epileptic fit:

Stage I.—The phenomena are a single, peculiarly disagreeable *cry, yell,* or moan in many cases, but not in all, immediately followed by *absolute* and *instantaneous loss of consciousness,* the patient falling anywhere, or often appearing to be thrown down; a violent *tonic spasm* of the muscles throughout the body, beginning generally about the face and neck, the whole muscular system being in a state of extreme rigidity and strain, but not equally so, and hence there is a hideous distortion of the features, limbs, and body, the latter being drawn to one side, and the neck twisted so that the face looks over one shoulder, while the teeth are firmly clenched, the eyes wide open, and the eyeballs turned up or in; *stoppage of respiration,* usually complete, from spasm of the muscles; *change in color of the face* almost invariably, in many cases deadly pallor being observed at first, followed by duskiness or lividity, or this may be present from the commencement, or be preceded by florid or dull redness; marked *dilatation of the pupils; feebleness* or *cessation of the pulse at the wrist,* due to the muscular spasm, as the heart is acting forcibly and the carotids throb violently. Practically these phenomena may be considered as simultaneous, the whole stage not lasting longer than from two or three to 30 or 40 seconds.

Stage II.—The transition to this stage is abrupt, being indicated by a restoration of breathing, the respiratory muscles becoming relaxed and the retained air expelled. Unconsciousness continues, but severe *clonic spasms* takes the place of the tonic rigidity, usually beginning with twitchings about the face or sometimes in the limbs, but soon extending more or less over the body, though often more violent on one side than the other. From these originate the phenomena of this stage, viz., hideous distortion and convulsive movements of the features and eyeballs; forcible closure and champing of the jaws, with grating of the teeth, foaming at the mouth, partly due to formation of excess of secretion, which is blown out of the mouth, and biting of the tongue or cheek, the froth being therefore often bloody; violent convulsive movements of the body and limbs, which are thrown about and twisted in all directions, the fingers being generally bent and the thumb pressed into the palm; alternate dilatation and contraction of the pupils; labored panting and irregularly convulsive respiratory movements, often attended with sounds due to mucus in the trachea; increasing duskiness or lividity and turgidity of the face, tongue, and body generally, with distension of the veins, some of the smaller vessels sometimes giving way, and causing excessive petechiæ about the face or head; perspiration, the sweat being sometimes peculiarly fetid; tumultuous action of the heart, with throbbing of the large arteries, though the radial pulse is often weak: involuntary discharge of urine, fæces, or semen, and frequently rumbling noises in the intestines, vomiting, or hiccup. The average duration is said to be from 4½ to 5½ minutes, but it may vary from a few seconds to 10 minutes. The clonic spasms are believed to be the result of the *stoppage of respiration* in the previous stage, with consequent asphyxia.

Stage III.—There is *gradual* return of consciousness, with cessation of the spasmodic movements. The patient looks around with a bewildered, alarmed, or sad expression, and often attempts to get up or to speak, but some few minutes usually elapse before consciousness is completely restored. The heart still acts vigorously, and the skin is bathed in sweat. Vomiting often takes place. A large quantity of pale and watery urine may be passed, with excess of urea and urates, or sometimes of phosphates, and it is said a trace of sugar has been found after a severe fit. After return to consciousness, the patient is usually very exhausted and sleepy, mentally confused, and complains of headache. In many cases, but by no means in all, he falls into a state of heavy sleep or stupor, almost amounting to coma, attended with a stertorous noise in breathing, from which it is difficult or impossible to rouse him, and which lasts for a variable time, sometimes passing into natural sleep. The muscles are relaxed, with occasional twitchings, or slight spasmodic movements. The face generally remains more or less dusky for some time, and the petechiæ are visible. The patient is often languid and out of sorts for some days after a fit.

The *frequency* and *severity* of the fits vary much in different cases. In a good many there is a tolerably marked periodicity. In few instances does the interval extend beyond a month. The seizures are more frequent, as a rule, in severe cases, and they tend to increase in both these respects as they advance. Not uncommonly two or more fits occur in succession, followed by a period of freedom. They are liable to come by night as well as by day.

The *general state of the patient* also differs considerably. There is rarely perfect health, especially after epilepsy has existed some time. Many epileptic patients suffer from headache or giddiness, and various other symptoms, the general system and digestive organs being out of condition also. The mental faculties become more or less weakened in most cases, which may end in complete dementia, or dangerous mania. Sometimes partial and limited paralysis, twitchings, curious movements, alteration in sensation, or in the special senses, and other nervous phenomena, are observed. As complications of the fits, coma from injury to the head, apoplexy, or meningitis may arise.

DIAGNOSIS.—The chief conditions from which a true epileptic seizure may have to be distinguished are hysteria, reflex convulsions, epileptiform attacks due to organic diseases, uræmia, or chronic alcoholism, syncope, and feigned epilepsy. Some of these will be alluded to in a future chapter.

PROGNOSIS.—A cautious opinion should always be given in epilepsy as to the final issue. Very rarely does a fit end fatally, but this might happen from complications. As to the curability or improvement of the disease, the favorable prognostic circumstances are, that the disease is recent, or due to some definite cause, which can be rêmoved, the patient being very young and a male; absence of hereditary taint, the mind being unaffected and the fits being frequent. The mental faculties are more liable to become affected in females; in persons who are strong and healthy; when the disease begins late in life; when the fits occur in rapid succession, with attacks of "petit mal;" and it is said, when the spasms are not marked during the fit, and there is little or no subsequent coma.

TREATMENT.—1. *During a fit.* It is best not to interfere much, as a rule, merely attending to the matters mentioned when speaking of convulsions in general, preventing injury, but not holding the patient forcibly, and putting something between the teeth. If the fit does not soon cease, water may be dashed over the face and chest, and should it be dangerously prolonged, the measures which might be of service are, application of sinapisms to various parts, a warm bath, with cold affusion while in it, ice to the spine or head, stimulant enemata, electricity, local removal of blood from about the head, or even venesection if there is great danger of asphyxia. After a fit the patient should be placed in a comfortable position, kept quiet, and allowed to sleep.

2. *In the intervals.* There are certain principles to be followed in the management of an epileptic case. *a.* It is requisite to look for and remove any *local cause of irritation*, such as a foreign body irritating a nerve, worms, &c. Further, epilepsy may depend on some central organic mischief, and careful investigation is required, in order, if possible, to find out and treat any such disease, *especially if due to syphilis.* Any condition of general ill health, as rickets or tuberculosis, must be attended to, if present. *b. The general management* of an epileptic is highly important. He should have a nutritious, but light and digestible, diet; take

moderate daily exercise in the open air; be surrounded by proper hygienic conditions; avoid much mental work, especially in the case of children, who should be kept from school; though if the general health is good, older patients may follow some light occupation; have cold or tepid sponging daily, with friction afterwards; check any vicious habit, such as excessive venery, masturbation, or intemperance, and take a sufficient amount of sleep, the head being well raised at night. It is necessary to regulate the alimentary canal, especially avoiding constipation, but only using mild aperients. Iron if there is anæmia, quinine, strychnine, and other tonics are often of service. Many epileptics require constant watching, and all need more or less supervision; above all, not being allowed to go into positions of danger from falling, or near a fire or water. Epileptics decidedly ought not to marry.

3. *Specific Treatment.*—Innumerable "specifics" have been brought forward for the cure of epilepsy. Of these the only drugs that deserve special mention are bromides, especially bromide of potassium, belladonna or atropin, stramonium, conium, extract or tincture of cannabis indica, preparations of zinc, especially the oxide, sulphate (given in gradually increasing doses up to 10, 15, 20, or more grains, thrice daily), valerianate, and acetate, nitrate of silver in minute doses, opium in small quantities, and chloroform inhalation, not to induce complete insensibility, either systematically employed at certain intervals daily, or only administered when there are signs of a fit coming on. Doubtless all these may prove serviceable in different cases, and sometimes they may be usefully combined, as belladonna with sulphate of zinc. Bromide of potassium has been found eminently beneficial given in doses of 5, 10, 20, 30, or more grains thrice daily, on an empty stomach. It almost always lessens the number of fits, often keeps them off entirely, though the dose has generally to be gradually increased in order to accomplish this end, and sometimes a complete cure is effected. The bromide is found to be particularly useful when the attacks are chiefly or entirely of the "haut mal" type, when they are very frequent, and when they occur mainly by day. Dr. Chapman treats epilepsy by constant application of ice to the spine. In obstinate cases, local removal

of blood from the back of the neck, with counter-irritation by blisters, setons, issues, &c., is recommended. The treatment by clitoridectomy, castration, circumcision, and such methods, need only be mentioned to be condemned.

CHOREA—ST. VITUS'S DANCE.

ETIOLOGY AND PATHOLOGY.—Many views have been advanced as to the nature of chorea, but it will not serve any practical purpose to allude to them. No characteristic morbid appearances have yet been discovered. The *embolic theory* is prominent at present, first started by Kirkes, and supported by H. Jackson, Broadbent, Bastian, and others, viz., that chorea is the consequence of impaction of *minute emboli*, either conveyed from deposits on the valves of the heart, or formed of agglomerations of white corpuscles (Bastian), and lodged in the small vessels of the convolutions near the sensori-motor centres, viz., the corpora striata and optic thalami; or in these themselves and other neighboring parts of the brain. Hence there is impaired nutrition of these nerve-centres, leading to disturbance but not complete abolition of their functions. This *embolic theory* is believed especially to apply to those cases in which chorea accompanies *acute rheumatism*. When the latter disease occurs in the young, choreic symptoms are very liable to arise. Occasionally, also, there are signs of endocarditis or pericarditis with chorea, and high temperature, but no joint-symptoms. It is highly probable, however, that the disturbance of the nutrition of the sensori-motor ganglia which leads to chorea may result from other causes besides embolism, such as slight local disease or hemorrhage, disease of the vessels, mental shock, reflex irritation, conveyed from some distant part, or an impure state of the blood. Some believe that chorea is due to some *definite change in the blood*, and that the complaint is allied to the acute specific diseases. In a large proportion of cases, anæmia exists. Among the chief *exciting causes* to which chorea has been attributed, are *sudden fright*, or other emotional disturbance, especially when acting on a child previously weak and anæmic; imitation when children associate with others who have the complaint; injury to the head or to some local nerve; reflex irritation from worms;

painful second dentition, masturbation, menstrual derangement, or pregnancy. Frequently no obvious cause can be made out, except the condition of the blood and general system.

There are some important *predisposing causes*, viz., the female sex, early age, especially from 5 to 15; hereditary tendency to various neuroses, bad living, and improper hygienic conditions, with consequent imperfect nutrition; a recent attack of some acute lowering illness, and a damp and cold climate. Anomalous choreiform movements may occur at any time of life in connection with various organic cerebral diseases. Some movements observed in children, and also in adults, are merely the result of bad habits, such as closure of the eyelids or twitching of the mouth.

SYMPTOMS.—Chorea is characterized by peculiar persistent involuntary movements of various muscles, partaking of the character of clonic spasms, with loss of control over voluntary actions, the will appearing to have its influence over the muscles diminished, while co-ordinating power is impaired. The complaint generally runs a definite course, though of variable duration, the symptoms setting in gradually, reaching their height in about two or three weeks, at which they remain for a variable time, and then subside. Sometimes, however, it remains as a chronic condition. The first signs which attract notice are, that the patient seems restless and fidgety, cannot keep quiet, jerks one of the limbs about occasionally, halts or drags one of the legs in walking, makes grimaces, does various acts awkwardly, or drops and breaks things. The phenomena of the established disease are very characteristic. The term "insanity of the muscles" has been well applied to the absurd involuntary movements which are observed. As a rule, they are moderate in intensity, and not painful; they exhibit great variety in combination, and are not mere jerks of the muscles, but more like restless movements, often conveying an idea of purpose or design. The head is moved about in various directions; the face exhibits all sorts of ridiculous grimaces; the tongue is often thrust out and coiled, and then withdrawn again, or pushed into the cheek, or drawn into the throat, as if an attempt were being made to swallow it; the shoulders are jerked up, the arms thrown about, and various fidgety movements carried on about the hands and fingers; the legs are frequently unaffected, being always much less disturbed than the arms; respiratory movements are infrequent, jerky, and irregular, the natural relations of the abdominal and thoracic movements being perverted during breathing; and sometimes there is a dry nervous cough or grunting sound. It is not often that the muscles of the trunk seem much affected, but choreic patients are usually unable to sit or lie quietly for any time. The muscles of the larynx are rarely affected, those of the pharynx never. Very commonly these involuntary movements commence and are more marked on one side than the other, or they may be entirely unilateral, or even confined to one limb. They are much intensified by attention being directed to them, and under the influence of emotion. The strong effort of the will or a deep inspiration may temporarily control them, but they are worse afterwards. During sleep they cease, but may occur under the influence of dreams.

The want of control over the voluntary movements is seen in every act the patient performs, such as walking, holding out the hand, putting anything to the mouth, eating or drinking, smiling, attempting to take hold of or carry any object, which is generally allowed to fall or is thrown down. Articulation is generally indistinct and jerky. Micturition may be difficult on account of jerking of certain muscles. The sphincters are never affected. The muscles are in a state of decided weakness, amounting to slight paralysis. A sense of fatigue and nervous exhaustion is usually experienced, and aching in the limbs, headache, and pains in the back are often complained of. The expression seems to point to some degree of mental defect, but this is mainly due to the movements of the muscles, though in many cases, especially if of long duration, the intellectual faculties are somewhat obscured.

The general health is almost always below par, anæmia being often a prominent feature. Temperature is normal, unless the chorea is associated with some pyrexial condition. The digestive organs are out of order in many cases. The urine is at first usually concentrated, contains excess of urea, frequently deposits urates abundantly, and also oxalates and phosphates sometimes. Special attention must be drawn to the *state of the heart.* In all cases of chorea it is desirable to examine this organ every day if practicable. A basic anæmic murmur may be heard, but it is a *mitral regurgitant murmur* which must be specially looked for. This may be *inorganic,* from irregular muscular action, or *organic,* associated with *valvular lesion,* which may be set up *without any of the external phenomena of acute rheumatism.* The former is distinguished by its being not very loud or harsh; frequently by its irregularity, being heard at one time and not at another; and by its disappearance as the patient improves.

Cases of chorea occasionally occur in which the symptoms are extremely acute and intense, the spasmodic movements being excessively violent and constant, extending throughout the body. The patient is unable to swallow or perform any voluntary act, and is greatly distressed and exhausted, sleep being impossible. Death ensues if the movements do not abate, often preceded by adynamic symptoms, delirium, or coma, but the intellect may be almost clear to the last. Two such fatal cases, occurring in girls about the period of puberty, have come under my notice, and similar attacks have been observed in connection with parturition.

DIAGNOSIS.—The symptoms of chorea are so characteristic, that it is scarcely possible to make a mistake in diagnosis, and therefore no special remarks need be made on this subject.

PROGNOSIS.—Almost always recovery ensues, except in the severe cases previously alluded to. No definite opinion as to duration should be given. The circumstances favorable to a speedy recovery are that the chorea is due to some condition which is amenable to treatment, that this is commenced early, and that the patient can be placed under proper sanitary conditions. The danger of cardiac complication should always be borne in mind.

TREATMENT.—It is difficult to estimate the value of remedies in the case of chorea, as the complaint so often tends towards spontaneous cure. It appears to me that certain matters should always be first attended to, viz., 1. To get rid of any obvious cause of reflex disturbance. 2. To regulate carefully the diet, and the state of the digestive organs, especially keeping the bowels acting freely. 3. To improve the general health and state of the blood by nutritious food, proper hygienic conditions, change of air, cold or tepid bathing or the douche, especially over the back, with friction afterwards, and the administration of some preparation of iron, especially if there is anæmia. Many cases do well under the use of ferruginous preparations, especially the sesquioxide, tincture of sesquichloride, ammonio-citrate or carbonate. A great many *specifics* have been brought forward, especially salts of zinc, liquor arsenicalis, tincture of belladonna, conium juice, hydrate of chloral, tincture of cannabis indica, hypophosphates, Calabar bean in the form of powder, extract, or tincture, a combination of morphia with strychnia, or chloroform inhalation twice or thrice daily. From personal experience I do not think any one of these remedies is applicable to all cases, but one or other may be found of service in different instances. The application of ice to the spine, the passage of a slight constant galvanic current along this region, and subcutaneous injection of curare are other special modes of treatment which have been advocated. The movements may often be diminished by proper discipline and gymnastic exercises. When a case is seen in the very early stage, some believe they can check the course of the disease by exciting a free action of the skin by warm or hot-air baths, followed by saline medicines, or small doses of tartar emetic. Others employ emetics at the outset. Should sleep be much disturbed, some narcotic must be given. If the movements are very severe, it will be well to let the patient sleep on an air- or waterbed. Chorea complicating acute rheumatism usually needs no special treatment. Those dangerous cases in which the movements are extremely violent, are but little amenable to any treatment. Inhalation of chloroform, subcutaneous injection of morphia, or perhaps curare, and supporting the patient by enemata if necessary, seem to me the best remedies to employ.

Hydrophobia—Rabies.

Etiology and Pathology.—Hydrophobia is unquestionably a *specific contagious disease*, resulting from the action of a *specific poison* of unknown nature, which in the human being is almost invariably introduced into the system through the bite of a mad dog inflicted upon some exposed part of the skin, but is in rare instances transmitted from other allied animals, as the cat, wolf, or fox. No characteristic post-mortem appearances have as yet been discovered.

SYMPTOMS.—A very indefinite *period of incubation* intervenes between the infliction of the wound and the development of the symptoms of hydrophobia. About forty days is said to be about the average, but it may vary from a few days to many months, or, it is said, even years. In some cases unusual objective appearances or subjective sensations are developed in connection with the bite, before the symptoms break out.

At first the patient feels uncomfortable, low-spirited, despondent, restless, has an undefined feeling of anxiety or dread, and complains of giddiness or alternate chills and heats. Then follows a sense of oppression in the chest, with involuntary, deep sighing inspirations from time to time, or a sudden catch in the breathing may first occur, attended with severe pain in the epigastrium, due to spasm of the diaphragm. The subsequent characteristic symptoms are grouped by Mr. Erichsen as: 1. Spasmodic affection of the muscles of deglutition and respiration. 2. Extreme sensibility of the surface and of the special senses. 3. Excessive mental terror and agitation. The nature of the malady is generally revealed to the patient by a fit of choking, brought on by an attempt to drink, and by finding that swallowing is impossible. This condition becomes rapidly worse and worse, each attempt to drink bringing on a spasm of the muscles of deglutition and respiration, which is attended with a feeling of intense oppression and suffocation, causing great distress. Not unfrequently solids can be swallowed at first without producing any disturbances. Soon the sight or sound of any liquid, or anything that even suggests drinking, brings on the spasmodic attacks, and the patient spits the viscid secretion out of the mouth as fast as it forms, so as not to be tempted to swallow it. Soon the skin and special senses become extremely sensitive, so that the least touch, or a sudden sound or light will bring on the spasms, which ultimately extend to other muscles, assuming more or less the characters of general convulsions. The patient is in a state of great terror, anxiety, and depression, combined with restlessness. Often fits of furious mania subsequently occur, in which the patient is extremely dangerous, and utters strange sounds, which has given rise to the idea of barking being a symptom of this disease. In the intervals the intellect is generally quite clear. Sometimes there are curious persistent delusions. As the case progresses towards a fatal termination, which is always the final result, the special symptoms diminish, or may even disappear altogether, and the patient gradually sinks from exhaustion and collapse. Rarely death occurs suddenly from suffocation during a fit of spasm.

TREATMENT.—The great thing is to *prevent* hydrophobia, by immediately cauterizing the part bitten by means of the hot iron or potassa fusa; or by complete excision. Other modes of preventive treatment are quite useless. The patient's mind should be calmed as much as possible, and he should be prevented from brooding over his danger. There is no remedy, that I know of, of any real service in hydrophobia, once the disease has become developed.

TETANUS—LOCK-JAW.

ETIOLOGY AND PATHOLOGY. — Though almost always of *traumatic* origin, and therefore occurring in surgical practice, a brief description of tetanus is needed here, as it occasionally comes under the notice of the physician as an *idiopathic* affection, resulting from cold or wet, or from sleeping on damp ground, or becoming chilled when perspiring, or in infants soon after birth. It is probably a functional disorder of the spinal cord, dependent upon peripheral nerve irritation, leading to reflex disturbance. Certain morbid appearances have been described in the cord, but they cannot be said at present to be characteristic.

SYMPTOMS.—The peculiar features of tetanus are *persistent tonic spasm or rigidity* of the muscles; with extremely *painful paroxysms of cramps* occurring at intervals. The first complaint is generally of pain and stiffness behind the neck, which increases until the muscles have become fixed, the head being drawn back. Then *trismus* or *lock-jaw* sets in, and swallowing becomes difficult. Next, the rigidity extends to the muscles of the trunk, and finally may involve all the voluntary muscles, except those of the hands, eyeballs, and tongue. They feel hard, tense, knotted, and rigid. The body is generally curved backwards (*opisthotonos*), but may be rigidly stretched out (*orthotonos*), bent forward (*emprothotonos*), or laterally (*pleurothotonos*). A very painful feeling of constriction is experienced in the epigastrium, shooting to the back. Some paroxysms of painful spasms occur, at first slight and at long intervals, but becoming rapidly more frequent, intense, and prolonged, being excited by any slight disturbance, as a touch, or a noise, or coming on spontaneously, and at last being almost constant. During these fits the patient is in great distress; the muscles stand out and become extremely hard, and the back is often so curved that only the head and heels touch the bed; the countenance presents the "risus sardonicus," and has a peculiar aged expression, combined with that of anguish. Breathing is stopped, owing to the fixation of the respiratory muscles, causing an extreme feeling of oppression and impending suffocation, but it is comparatively free in the intervals. The voice is weak. During the attacks there is much heat and sweating, and the pulse is very frequent and small. Soon it becomes impossible for the patient to swallow anything, though often very hungry and thirsty, while the mouth is clogged with viscid mucus. Sleep is entirely prevented. There are no head-symptoms, and the intellect remains undisturbed. The pupils are dilated. Cutaneous sensation is not affected; but there is increased reflex excitability. The power over the sphincters is retained; constipation is generally present; and micturition is often difficult. Death is almost always the termination, either from sudden or gradual apnœa, asthenia from exhaustion and want of support, or both combined. The temperature frequently rises to a very high degree before death, and continues to rise post mortem. Recovery occasionally takes place, but convalescence is very slow. Temporary remissions not uncommonly occur, which are apt to mislead. Tetanus now and then assumes a somewhat chronic course. It is usually less acute in its progress when *idiopathic*, than when *traumatic*.

DIAGNOSIS.—Strychnine poisoning is the chief condition from which tetanus has to be distinguished. It might possibly be mistaken for hydrophobia, acute spinal meningitis, or certain cases of hysteria.

PROGNOSIS is extremely grave, as may be gathered from what has been previously stated.

TREATMENT.—The only measures which seem to me of any service in *idiopathic tetanus*, are to use warm, vapor, or hot-air baths freely; to administer subcutaneous injections, either of morphia, curare, or nicotin; to relieve the spasms by inhalation of chloroform; and to support the patient by liquid nourishment and stimulants, administered in the form of enemata when they cannot be swallowed. All sources of disturbance must be removed, and the patient kept quiet. Ice to the spine has been recommended, but in one case which came under my observation, no good effects resulted from it.

CHAPTER LX.

IN the present chapter, the conditions resulting from the entrance into the system of certain poisons will be considered, and also the phenomena of sunstroke.

ALCOHOLISM.

ETIOLOGY.—The injurious effects upon the system of alcoholic abuse are but too well known. They are the result of its direct irritant action; its influence on the vaso-motor nerves; its own poisonous properties, or those of the products of its decomposition, circulating through the various organs and tissues; and of its interference with tissue-metamorphosis, oxygenation, and nutrition. The exact effects will depend on the nature, quantity, and strength of the stimulant indulged in. Spirits do by far the greatest harm, especially when taken in frequent drams, strong, and on an empty stomach. Alcoholism is most frequent in males; in those who from their occupation are exposed to intemperance, as draymen, potmen, cabmen, &c., or whose calling is a lonely or sedentary one. It is also predisposed to by various conditions which depress the nervous system, as working or sleeping in a hot, vitiated atmosphere, excessive mental work, anxiety or worry, or excessive venery. Persons who suffer severe pain and hysterical individuals are very likely subjects for alcoholism. In not a few instances there seems to be a *hereditary tendency* to alcoholism, or to some neurosis, as epilepsy or mania.

SYMPTOMS.—Cases of alcoholism come under the following groups: 1. *Acute alcoholic poisoning,* the symptoms being those of narcotic poisoning. 2. *Delirium tremens.* 3. *Chronic alcoholism.* 4. *Acute mania,* in which the patient is extremely violent and dangerous and has a fixed delusion. 5. *Acute melancholia,* with suicidal tendency. 6. *Oinomania,* where there is a constant craving for drink, and this breaks out at intervals into an uncontrollable propensity, the usual sense being entirely dead, and the subject of this condition will do anything for drink. Only *delirium tremens* and *chronic alcoholism* need be further considered here.

2. *Delirium Tremens.*—The circumstances under which delirium tremens comes on are as follows: 1. From mere excessive drinking in a temperate person. 2. An individual who is accustomed to drink freely gets drunk. 3. An habitual tippler who, without being actually drunk, is always more or less fuddled from saturation with alcohol, has some slight disturbance, especially of a *traumatic* kind; or delirium tremens may arise even without any apparent cause. 4. Deprivation of proper food, with moderate indulgence in stimulants. 5. Sudden cutting off of stimulants in an individual who has been accustomed to drink freely, especially if old or debilitated. 6. Inhalation of fumes from a distillery, it is said (?). Most cases result from abuse of spirits.

Generally there are *premonitory* indications, especially disturbed sleep or absolute insomnia, and also general discomfort and feebleness, agitation and trembling, mental confusion and inability to fix the attention, timidity and lowness of spirits. The alimentary canal is commonly disordered, as evidenced by anorexia, foul tongue and breath, unpleasant taste, constipation, with unhealthy stools. The *actual* symptoms are usually very characteristic. The patient is quite sleepless, or only obtains short uneasy dozes. The mind is in a state of general confusion, restlessness, and excitement, and though it may be possible to gain the attention of the patient for a moment, and to get a sensible answer to a question, he speedily wanders off and talks ramblingly and incoherently, there being a kind of busy delirium. A variety of mental delusions, illusions, and hallucinations usually exist, the patient fancying he sees or hears all sorts of objects and sounds, often of a hideous character, or distorting what he does see and hear into strange and horrible forms and noises. These delusions are generally transient and changeable, but occasionally the patient fixes upon one and reasons about it. Further, the mental condition is one of combined irritability, marked cowardice, sense of dread, and suspicion. The patient has an anxious, wandering suspicion, and looks upon everybody around with terror and distrust, imagining they are trying to poison or otherwise injure him, or fears that he may be injuring himself, and has a great sense of alarm as to what is going to happen. These feelings may culminate in fits of violent mania, attended with extreme muscular effort and a wild expression, the patient trying to injure those around, to jump out of the window, or do various other acts with the view of escaping from some imaginary enemy. There is usually no complaint about the head; creeping sensations over the skin and other paræsthesiæ are common, and the patient often fancies he sees or feels horrible insects crawling over him.

The prominent symptoms connected with the muscular system are restlessness, carphology, and *general tremors*, the latter being especially observed in the hands and tongue. After fits of violence there is much exhaustion and prostration. The pupils are, as a rule, dilated and sluggish. The important *extrinsic* symptoms are absence of fever, with profuse perspiration, which has often a very disagreeable smell, the skin feeling moist and clammy, especially that of the palms, or being even drenched; a weak, large and soft, or small and frequent pulse, often exhibiting marked "dicrotism" to the sphygmograph; and disorder of the alimentary canal, the mouth and tongue being very foul, and covered with sticky mucus, the breath peculiarly unpleasant, appetite completely lost, with much thirst, nausea being complained of, but rarely vomiting, the bowels being constipated.

The urine is sometimes much diminished, and is deficient in phosphates and urea, but often deposits urates, and the stools are offensive. Recovery is in many cases preceded by restoration of sleep, but this by no means necessarily leads to a favorable termination. In fatal cases, typhoid symptoms frequently set in, with a dry, brown tongue, sordes on the teeth, and low nervous phenomena, as muttering delirium, epileptiform convulsions, and coma. Sometimes sudden collapse occurs.

3. *Chronic Alcoholism.*—Various grades of this condition are to be constantly seen, especially in hospital practice. A very able description of it is given by Dr. Anstie. The ordinary signs may be summed up generally as follows: *a. Nervous phenomena*, viz., muscular restlessness and fidgetiness, leading to tremors, beginning in the limbs, at first slight, and controlled by an effort of the will, but afterwards more marked and constant, worse in the mornings, and then diminished by food and drink; insomnia or very disturbed and unrefreshing sleep, with horrible dreams; diffused dull pain or heaviness in the head, and sudden attacks of vertigo; disorder of the special senses, as evidenced by photopsia or muscæ volitantes, and noises in the ears; mental disturbance, indicated in the early period by mental inquietude, uncertainty of purpose and inability to fix the attention upon anything, indecision of character, a vague sense of dread, or fits of violent temper, later on by impairment of the mental faculties, in some cases very marked, the patient having horrible visions or delusions as to people plotting his ruin, and exhibiting great cowardice, with loss of moral power, and a particular tendency to lie about drunk; impairment of muscular co-ordination, which accounts for the sensation sometimes experienced by the patient, as if he were going to fall down a precipice when walking on firm ground. *b. General appearance.* The signs coming under this head are, more or less obesity, or emaciation, the former being chiefly observed in beer-drinkers, the latter, which may be extreme, in spirit-drinkers; flabbiness or a bloated state of the features, with red and watery eyes, yellowness of the conjunctiva from fat or jaundice, and often redness of the face, especially about the nose and

cheeks, with enlarged vessels, and acne. *c. Disorder of the alimentary canal,* indicated by total anorexia or disgust for food, especially in the mornings, the patient often making this an excuse for taking stimulants, in order to "keep up" the system; thick, dirty furring of the tongue as a rule, but not always; dryness and cracking of the lips; catarrh of the pharynx; peculiar and disgusting foulness of the breath; severe morning nausea or actual sickness; irregularity of the bowels, with fetid stools; occasionally serious hemorrhage from the stomach or bowels. *d. Symptoms due to organic visceral changes, and to degenerations.* These have been indicated in previous chapters, and, as already stated, there is much difference of opinion as to the influence of alcohol in their production. There can be no doubt as to the *direct* effect of strong spirits upon the mucous membrane of the alimentary canal, and especially that of the stomach, inducing congestion, chronic inflammation, fibroid changes, and glandular degeneration, or that alcoholic abuse tends to lead to fibroid and fatty degeneration, with atrophy of various organs and tissues, including the nerve-centres.

In very advanced cases of chronic alcoholism, still more grave nervous symptoms are met with, such as absolute dementia, marked sensory paralysis in different parts, extreme muscular trembling, simulating paralysis agitans, general muscular weakness, paralysis or ataxia, epileptiform attacks, or finally coma. In these cases serious organic changes must have been set up in the nervous system.

DIAGNOSIS.—Delirium tremens has to be mainly distinguished from acute mania or meningitis. The circumstances under which it occurs, characters of the nervous and extrinsic symptoms, and absence of *fixed* delusion, generally leave no doubt as to the nature of the case; sometimes it clearly resembles some low fever. Chronic alcoholism *should be always suspected,* if any of the symptoms mentioned are complained of, not forgetting digestive disorders, but especially if there is morning sickness, insomnia, fidgetiness or tremor, mental restlessness, disturbance of the senses, &c. Close inquiry is often needed in order to detect intemperance in these cases, as the patients try to conceal it in every possible way. Anstie enumerates the following nervous diseases as being particularly liable to be simulated by chronic alcoholism, viz., commencing general paralysis of the insane; paralysis agitans; lead-poisoning; locomotor ataxy; softening of the brain or cord; epilepsy; senile dementia; hysteria; and the nervous malaise associated with some forms of dyspepsia.

PROGNOSIS.—In delirium tremens, which usually terminates favorably, the chief unfavorable circumstances are: Chronic indulgence in excess, so that the system is more or less saturated, the patient being advanced in years, enfeebled in constitution or suffering from organic visceral disease, especially of the kidneys; a history of previous attacks, especially if numerous; difficulty in getting nourishment into the system, either from the patient refusing it, or from assimilation being impaired; inability to procure sleep before the patient is much exhausted; an unfavorable condition of the pulse, as evidenced by the sphygmograph; the occurrence of typhoid or low nervous symptoms; and the development of inflammatory complications, especially pneumonia. In the early period chronic alcoholism can always be cured, if the patient will keep away from drink, but this is often a very difficult matter to accomplish. When serious nervous symptoms have become developed, there is but little hope.

TREATMENT.—In treating delirium tremens, the first object ought to be, to *withdraw, or reduce the quantity of all forms of alcoholic stimulant,* so far as is practicable, but especially *spirits* and *wine.* In a large proportion of cases, it has been found that no harm results from cutting off stimulants completely, especially in the young and in first attacks; in others they must be moderated as much as possible, being chiefly needed if the patient is an habitual drinker, old, or feeble; or if there are signs of adynamia. It is well to keep to malt liquors, if it can be managed, but brandy may be required. At the same time it is highly important to get *as much nourishment as possible into the system.* Strong beef tea, beef-juice hot, soups, milk, eggs beaten up, and other forms of nourishment, which are readily assimilated, must be given *at frequent intervals, by night as well as by day.* If the patient refuses food, white of egg, mixed with iced water, is useful, and nutrient enemata must be employed regularly. In the case of strong patients, especially if they are young, and a large quantity of spirits has been taken, a brisk watery purgative is decidedly beneficial at the outset, but this is not always advisable. The next indication is to endeavor to *procure sleep before the patient is exhausted.* For this purpose certain drugs are most useful when employed in *moderate* doses, especially morphia, which is best introduced by hypodermic injection (gr. $\frac{1}{8}$ to $\frac{1}{2}$); hydrate of chloral (gr. xx every hour or two); bromide of potassium (gr. xx every two hours); and extract or tincture of cannabis indica. I quite agree, as a general rule, with Anstie and others, against the idea, that "patients in delirium tremens require to be narcotized into a state of repose," but I have met with cases in which the only chance of recovery seemed to be to procure sleep at any risk, and where the administration of considerable doses of morphia, combined with abundant nourishment, proved, I believe, the means of saving life. Other remedies employed in delirium tremens are tincture of digitalis in large doses (ʒij to ℥j every four hours), originally introduced by Mr. Jones, of Jersey; tartar emetic in sthenic cases, with wild delirium; and chloroform, either by inhalation or internally. My own experience is not favorable to these modes of treatment, as a rule, but chloroform inhalation carefully employed may be serviceable sometimes.

Symptoms often require attention in this disease, especially vomiting. If there are adynamic signs, medicinal stimulants must be given, as ammonia, ether, musk, or camphor, as well as brandy. Complications may call for interference, particularly *pneumonia,* which always needs a supporting treatment in these cases. A patient suffering from delirium tremens should be placed in a comfortable and well-ventilated room, kept quiet and apart from friends, only one or two trained attendants being permitted to be present, according as the patient is peaceable or violent, treated kindly but with firmness, and constantly watched, lest he should injure himself. Mechanical restraint, as by the strait-waistcoat, is but rarely admissible, though it is needed now and then in cases of extreme violence.

As regards chronic alcoholism, there should, in most cases, be no hesitation in forbidding stimulants entirely, but especially spirits or wine. It is often, however, difficult to get patients to carry out this advice. A glass of good bitter ale or stout, with food, may be useful in some instances, and Anstie recommends the latter at night in order to procure sleep. It is most important to get the patient to take nourishment, and as there is generally a great distaste for food, small quantities of milk, concentrated beef tea, or soups, or meat-juices should be given at frequent intervals. It is wonderful, however, how soon the appetite returns in many of these cases when the intemperate habits are relinquished. If there is much sickness, effervescents may be given, or soda-water with milk. I have found a mixture containing bicarbonate of soda or nitro-muriatic acid with infusion of gentian and three or four minims of hydrocyanic acid very serviceable in many cases. Anstie recommends one or two grains of quinine twice or thrice daily. Marcet found oxide of zinc useful beginning with two grains twice daily, and gradually increasing the dose. If there is much restlessness and sleeplessness, a full dose of bromide of potassium at night will generally procure sleep, or this drug may be given more frequently if necessary. Some prefer subcutaneous injection of morphia, hydrate of chloral, extract of cannabis indica, or a full dose of sulphuric ether. Baths are often serviceable in chronic alcoholism, and rest from occupation with change of air aids recovery materially. The bowels should be kept well opened.

In advanced cases the treatment must be varied according to the prominent symptoms present. Anstie has found the long-continued use of good doses of cod-liver oil most beneficial, with hypophosphites of soda or lime if there is commencing paralysis of sensation, bromide of potassium should there be epileptiform convulsions, and very minute doses of strychnine when there is marked muscular tremor.

Lead-Poisoning—Saturnism.

Etiology.—The introduction of lead into the system is most important in connection with certain occupations in which this metal is used, saturnism being especially common among painters, plumbers, and workers in white lead. Sometimes it is taken in water kept in leaden cisterns, in cider, in adulterated articles, or medicinally; it may be inhaled from fresh paint, and now and then enters the body in curious ways, as from using adulterated snuff, or rubbing the ointment into the skin. As a rule, the metal is either swallowed or inhaled, and often enters in both ways. It becomes in time deposited in the various organs and tissues, but especially in the muscles, nerves, and nerve-centres. It causes impaired nutrition in these, and the muscles undergo marked fatty degeneration and atrophy.

SYMPTOMS.—There are certain objective appearances, commonly very obvious in chronic saturnism, viz., the so-called blue line by the gums at their junction with the teeth; a dirty brown or black incrustation of these latter if they are not cleaned, with rapid tendency to decay; more or less emaciation, with a dry harsh skin, and a peculiar sallow, pale, or yellowish tint of countenance, with yellowness of the conjunctivæ. The breath is generally offensive, and an unusual sweetish taste is frequently experienced. In some cases the pulse is very infrequent and slow. The prominent clinical phenomena which may be associated with lead-poisoning may be summed up thus: 1. *Lead-colic*, having the characters of more or less severe *intestinal colic*, accompanied usually with a retracted abdomen, absolute constipation, nausea and vomiting, eructation, and hiccup. 2. *Disorders of sensation*, such as hyperæsthesia or hypæsthesia of different parts, numbness, formication, neuralgic pain, aching in the limbs and joints, and headache. 3. *Amaurosis*, either single or double, usually associated with other grave nervous symptoms, and accompanied with changes visible to the ophthalmoscope. 4. *Motor disturbance*, in the way of tremors, epileptiform convulsions or local paralysis. The most common and important variety of paralysis is that of the *extensors of the forearm*, giving rise to "wrist-drop," but the upper limbs are often affected more or less throughout, and the legs also in many cases, as well as muscles in other parts. As a rule both forearms are affected, but not equally. The muscles are generally wasted considerably, causing a depression on the back of the forearm, and the muscles of the hands may also be much atrophied, so as to make them assume the crow-foot shape. Sometimes they are strongly closed, as if the flexor muscles were rigid. The condition of electric contractility and sensibility has been already considered. As has been previously mentioned, when treating of this disease, the presence of lead in the system predisposes to the occurrence of gout.

TREATMENT.—Preventive measures are most important in the case of those working in lead. They should be very particular as to cleanliness, especially in washing their hands and cleaning their nails before eating, and in cleaning their lips and teeth. Every precaution should be taken against inhaling particles of lead. I think much of the metal is often introduced during meals, and the practice of taking a little dilute sulphuric acid in water at this time may be useful, as this would form an insoluble compound with any lead entering the stomach. The bowels must be kept well opened always. If there is any of the metal in the system, some iodide of potassium may be given from time to time. Colic must be treated in the same way as other forms of intestinal colic. The great remedy for getting lead out of the system, which is the main object to be aimed at in all cases, is *iodide of potassium*, a soluble iodide of lead being formed, which passes away in the urine and other excretions. It must be given for a long time. Sulphur baths are said to be useful. Paralysis, neuralgic pains, and other nervous symptoms must be treated according to the principles previously pointed out.

MERCURIAL TREMORS.

Individuals who work with mercury are liable to peculiar tremors from its inhalation, and they have also occasionally followed its medicinal employment. There are the usual signs of mercurialization in connection with the mouth and general system. The tremors almost always begin in the upper limbs, accompanied with numbness or formication and pains in the joints, but may afterwards extend to the legs, body, face, tongue, respiratory muscles; in short, to all except those of the eyeball. At first the movements are but slight, but afterwards increase so as to be spasmodic or convulsive, voluntary acts being performed in a violently jerking or spasmodic manner. They are greatly increased by any mental excitement. Finally there is more or less constant trembling, and the patient becomes quite helpless as to voluntary movements, speech and breathing being gravely affected also. In most cases the tremors subside if the patient is supported in a sitting or recumbent posture, and they also cease during sleep. Stimulants diminish them temporarily, but they are worse afterwards. The tremulous muscles are decidedly weak. In very advanced cases serious cerebral symptoms arise, as sleeplessness, delirium, coma, or epileptiform convulsions.

TREATMENT.—As soon as any symptoms appear, the patient should immediately give up his employment for a time. For the elimination of the mercury the chief remedies are warm, vapor, or sulphur baths; sulphur or iodide of potassium internally; with purgatives, medicinal diaphoretics and diuretics are also employed. For the nervous symptoms quinine, iron, opium, nitrate of silver, and galvanism are recommended.

SUNSTROKE—INSOLATION—COUP DE SOLEIL.

ETIOLOGY.—Long-continued exposure to the direct and powerful heat of the sun may produce grave nervous symptoms. These are chiefly met with in soldiers, and of course the cases are by far most frequent in tropical climates, but several have occurred in this country during late years. There are certain powerful predisposing causes, viz., wearing heavy or tight clothing and accoutrements; physical fatigue and exhaustion; the state of system induced by overcrowding and bad ventilation, and deficiency of drinking-water. Most authorities think a moist atmosphere is worse than a dry one. The immediate cause of sunstroke is believed to be interference with evaporation and radiation from the skin, so that the blood gets overheated, and thus has an injurious, depressing effect upon the nerve-centres. The only post-mortem appearances are fluidity of the blood; some congestion of the brain generally; and *extreme pulmonary congestion*, with distension of the right heart.

SYMPTOMS.—Generally there are premonitory symptoms, viz., great heat and dryness of the skin, there being a subjective feeling of burning or stinging, and the temperature being often hyper-pyrexial; marked debility and sense of exhaustion; thirst and nausea; vertigo, but not often headache; conjunctival redness; frequent desire to micturate; and sometimes delirium or delusions. Dr. Muirhead describes three varieties of the actual attack,—*cardiac*, *cerebro-spinal*, and *mixed*. In the first there is sudden syncope, often ending in speedy death. The *cerebro-spinal* form is characterized by coma; hurried, labored, noisy, or stertorous breathing; contracted and immovable pupils; reddened conjunctivæ; convulsions in many cases; tumultuous action of the heart, with a very rapid and soon feeble, compressible, and irregular pulse. The temperature may reach 112° or more, and continues to rise after death in fatal cases. Should recovery take place, sequelæ may be left, as constant headache, mental disturbances, choreiform movements, or a tendency to epileptiform attacks.

TREATMENT.—Attention should be at once paid to any symptoms indicating a danger of sunstroke. As a rule, the great remedy is the assiduous use of the *cold douche* over the head, neck, and chest, many repetitions of which may be required, but care is necessary in its employment. It helps to lower the temperature and restore the breathing. The wet sheet with constant fanning; injections of iced water; and application of ice to the shaven head and spine, are also recommended. The patient should drink freely, if he is conscious. If coma persists, a blister may be applied to the nape of the neck or scalp. The bowels must be opened freely by enemata. The patient must be properly supported by nutriment and stimulants, and medicinal stimulants may be useful, especially in syncopal cases. Inhalation of chloroform is recommended when there are severe convulsions.

CHAPTER LXI.

ORGANIC DISEASES OF THE BRAIN AND ITS MEMBRANES.

CLINICAL CHARACTERS.—The special clinical phenomena which are to be looked for as indicative of brain-affections, may be stated generally as—1. Morbid sensations in the head. 2. Mental disturbance. 3. Subjective disorder of the special senses. 4. Signs of irritation or paralysis of the cranial nerves. 5. Sensory and motor derangements in the limbs and trunk of *unilateral* or general distribution, sensation, however, being as a rule much less affected than motion. 6. Physical alterations about the head in some cases. 7. Objective changes in the eyes, as seen by the ophthalmoscope. 8. Certain extrinsic symptoms, especially vomiting and obstinate constipation. In some conditions also respiration and circulation are much affected, and in exceptional instances peculiar phenomena are observed.

The precise symptoms in any particular case of brain-disease, however, vary very widely, both in their nature and degree, according to the rapidity with which the mischief is set up, as well as the seat, extent, and number of distinct centres of lesion, and the effects it produces on surrounding parts. So far as is practicable, the clinical variations thus occasioned will be pointed out in the following chapters, but for fuller information reference must be made to the special writings of Hughlings Jackson, Brown-Sequard, Lockhart Clarke, Ogle, and others.

ACUTE INFLAMMATIONS OF THE BRAIN AND ITS MEMBRANES.

1.—ACUTE, SIMPLE, OR PRIMARY MENINGITIS.

ETIOLOGY.—The *exciting causes of simple meningitis* are: 1. *Direct injury to the membranes*, especially from fractures of the skull. 2. *Disease of the cranial bones*, particularly the temporal, in connection with ear affections. 3. Prolonged exposure to the sun. 4. Excessive mental labor. 5. Erysipelas of the head and face. 6. Local irritation from adventitious growths, &c. 7. It is said, exposure to cold and wet. 8. Certain acute exanthemata in rare instances. 9. Sudden disappearance of chronic cutaneous eruptions (?). It is also observed in epidemic cerebro-spinal meningitis, and may result from extension upwards of spinal meningitis. The disease is most frequently met with in male adults. A hot climate and season; mental work, especially combined with loss of sleep; a weak and exhausted condition of the system from previous illness or any other cause; intemperate habits, and the presence of Bright's disease, are regarded as *predisposing causes*.

ANATOMICAL CHARACTERS.—As a rule, acute meningitis involves the membranes extensively, but is most marked over the *convexity of the cerebral hemispheres*. It may, however, be localized, or be evident chiefly or solely about the base. The dura mater does not often present any particular change, unless it is locally affected from injury or bone disease, when it may be reddened, black, and sloughy, or unusually adherent; occasionally exudation or pus collects between it and the bone. Sometimes also inflammation is set up in the venous sinuses, leading to the formation of a thrombus, which may soften into a purulent-looking fluid, and give rise to embolism and blood-poisoning. Generally, the cerebral arachnoid appears dry and parchment-like, and more or less opalescent or opaque; sometimes it presents over its surface a thin layer of exudation or pus. The pia mater is extremely red and vascular, more so in some parts than others, while there are frequently small extravasations with patches of opacity around. In the early periods, a small quantity of serum, clear or more generally turbid and flocculent, and sometimes bloodstained, is seen in the arachnoid sac, and in the meshes of the pia mater. More commonly there is little or no fluid, but a soft, yellowish, opaque exudation, often more or less purulent-looking, covers the surface, particularly in the sulci between the convolutions, and along the larger vessels. When at the base it involves some of the cranial nerves. The brain frequently presents inflammation of the superficial layers of the gray matter, especially in prolonged cases, indicated by redness, softening, and adhesion to the pia mater. The ventricles are frequently normal, but may contain excess of serum or pus, or have the walls covered with exudation.

Symptoms.—As a rule, acute meningitis is preceded by *premonitory symptoms*, such as increasing headache or sense of heaviness, vertigo, disturbances of general sensation or of the special senses, irritability, with a feeling of depression and restlessness, and sickness. The attack is usually directly ushered in by a marked rigor or chilliness, speedily followed by both pyrexia and severe headache, with vomiting. In exceptional instances, the first symptoms are epileptiform convulsions, hemiplegia, aphasia, or stupor ending in coma. The clinical phenomena of the established disease are divided into certain stages, as follows:

Stage I, or *Stage of Excitement.*—At this time the symptoms are—*a. Local.* Intense and constant headache, generally chiefly frontal, of a tight or binding character, with sudden darting or plunging exacerbations, which may be so violent as to elicit sharp cries or shrieks, the pain being increased by any slight disturbance, as movement, noise, or light; marked vertigo; great heat of head, with flushing, or alternate flushing and pallor of the face, and conjunctival injection. *b. Mental.* Great irritability and unwillingness to be disturbed, with sleeplessness, culminating speedily in delirium almost always of an active character, not uncommonly amounting almost to mania, the expression being wild, staring, and savage, or sometimes indicating great terror, and the patient shrieking and gesticulating, or being very violent. Occasionally the delirium is more of a muttering kind. *c. Sensorial.* General hyperæsthesia, tingling, or formication in various parts; diplopia or dim vision, marked photophobia, photopsia or muscæ volitantes, tinnitus aurium, and undue sensibility to sound. *d. Motor.* General restlessness and jactitation; twitchings, or spasmodic movements in various muscles; especially those of the face and limbs, either unilateral or bilateral; or sometimes general convulsive movements, rigidity, tetanic spasms, local or hemiplegic spasms. Slight strabismus is usually observed, and it may be very evident, while the eyeballs move about convulsively, or stare fixedly. The pupils are very variable, but most frequently contracted or oscillating. *e. Extrinsic.* There is marked pyrexia, without prostration, the skin being very hot and dry, the temperature considerably raised, the pulse remarkably frequent, hard, and sharp, the tongue white, the mouth clammy, with great thirst and loss of appetite. Cerebral vomiting is a prominent symptom, and also constipation as a rule, the stools being offensive and dark. Breathing is generally irregular and moaning. The duration of this stage may vary from one to fourteen days, or more.

Stage II. *Transitional.*—This is characterized by the cessation of the symptoms of excitement just described, with the development of those indicating failure of the cerebral functions, and there may be a remarkable improvement at its commencement. Generally the change is more or less gradual, but may be very rapid, a sudden fit of convulsions occasionally ushering in the final stage. As a rule the headache, delirium, exalted sensations, and fever subside, while there is a tendency to heaviness, somnolence, or muttering stupor, ending in coma, with cutaneous hyperæsthesia, or anæsthesia and impairment of sight and hearing. Motor disturbances become more prominent and general, in the way of carphology, subsultus tendinum, twitchings, or tremors, spasmodic movements or convulsions, and paralysis.

The pupils become dilated and motionless. The body and limbs cool down considerably, though the head may be still hot; the pulse is less frequent, but very variable, and sometimes intermittent; the tongue tends to be dry and brown. Respiration is irregular and sighing. Urine is retained and may overflow. These symptoms culminate in:

Stage III, in which there is complete abolition of all the cerebral functions, as shown by absolute coma, with stertorous breathing; general anæsthesia, with muscular paralysis and relaxation; great dilatation and immobility of the pupils; involuntary escape of fæces and urine. There is an appearance of extreme prostration and adynamia, the features being sunken and ghastly, the surface bedewed with cold clammy sweats, the tongue dry and brown, the teeth and gums covered with sordes, and the pulse excessively rapid, thready, and fluttering. In this state the patient sinks more or less speedily.

Differences are observed in the symptoms, according to the seat and extent of the inflammation. If it affects only one hemisphere there may be hemiplegia. If it is localized, the symptoms are also limited. When the base is most affected it is said that the pain is more suborbital and suboccipital, the mental and sensorial excitement are less marked, delirium being comparatively slight and transient. Special paralyses of some of the cranial nerves are observed, while coma sets in early and speedily becomes profound. Ophthalmoscopic signs are evident when the inflammation is conveniently situated, viz., those of neuritis or ischæmia. Hyperæmia is commonly present.

Local inflammation of the dura mater, due to injury or bone disease, is very obscure as a rule. The symptoms are pain, at first localized, being often behind the ear, but gradually extending over the head; local tenderness here sometimes, or painful œdema, with little or no cerebral disturbance at first, but in time gradual somnolence, ending in coma, or sometimes delirium and convulsions; rigors, which may be periodically repeated, with pyrexia; diminished fulness of the jugular vein on the same side, if a thrombus forms; and signs of pyæmia and embolic deposits in other parts.

TUBERCULAR MENINGITIS—ACUTE HYDROCEPHALUS.

ETIOLOGY.—The immediate cause of this variety of meningitis is the local irritation set up by tubercles. Therefore, all causes predisposing to tuberculosis may be considered as predisposing to tubercular meningitis, and where a hereditary tendency exists, whatever leads to undue local excitement in connection with the brain, as forcing the mental faculties in young children, tends to give rise to a deposit here. Children are by far the most frequent subjects of tubercular meningitis, especially from two to ten years of age, but it may be met with from earliest infancy to old age, and is not uncommon up to the time of puberty and in young adults. Hereditary predisposition exists in a large majority of cases. This complaint not unfrequently follows one of the exanthemata.

ANATOMICAL CHARACTERS.—Miliary tubercles are found in greater or less abundance in the meshes of the pia mater, often adhering to the under surface of the arachnoid. They are frequently whitish and opaque, or may be softened and yellowish in the centre. They may appear scattered all over the surface, but are principally seen about the base of the cerebrum, in the fissures, especially the fissure of Sylvius, and along the chief branches of vessels. The membranes are injected, especially the pia mater. The surface of the arachnoid feels sticky, and a thin layer of soft lymph or puriform matter can often be scraped off. This usually exists in abundance between the arachnoid and pia mater, especially about the base and in the fissures; the pia mater is thickened and its meshes infiltrated with the same material or with serum. As a rule there is little or no fluid in the arachnoid sac. Occasionally the signs of inflammation are chiefly over the convexity. The ventricles of the brain, however, generally contain a considerable quantity of colorless, usually somewhat turbid and flocculent serum, often amounting to some ounces in each lateral ventricle, and this leads to œdema, maceration, and softening of the surrounding brain-structures, dilatation of the spaces and their communicating channels, and frequently to compression of the convolutions of the cerebrum against the skull, so that they are flattened and pale. Sometimes when the dura mater is opened the brain gives way, and the serum escapes. The walls of the ventricles are generally covered more or less with fine granulations. The exact appearances vary considerably in different cases; in some the signs of meningeal inflammation are the most prominent; in others the quantity of fluid in the ventricles is most striking. There is no proportion between the amount of tubercle and of the products of inflammation. Tubercle generally exists in other structures, and it may be present in the brain itself.

SYMPTOMS.—Tubercular meningitis in children is generally preceded for a variable period by those *premonitory symptoms* previously described as being observed in connection with tuberculosis, and nervous symptoms are often prominent, as fretfulness, drowsiness, sudden starting, screaming, or grinding of the teeth during sleep, headache, vertigo, staggering gait. They may, however, be entirely absent, while in some cases the disease supervenes on long-standing tubercular disease in other parts. The symptoms of the established disease are described as following certain stages, and these have been differently characterized by different writers. Certainly they are often very indistinctly marked in practice, and cases present a good deal of variety in their clinical history. The meningitis may be very obscurely indicated, being but a part of general acute tuberculosis; or its symptoms may be those which attract attention. The characteristic phenomena are usually those of basic meningitis, with general cerebral excitement, followed by total abolition of the cerebral faculties from the pressure of the fluid.

The invasion is in most cases more or less gradual, and not infrequently very insidious. Sometimes it is very rapid or sudden. The chief invasion-symptoms met with are, severe vomiting, intense headache, rigors, followed by pyrexia, marked irritability, nervousness, and obstinacy or unreasonableness in behavior, and drowsiness. Occasionally the disease sets in with sudden convulsions, delirium, coma, or paralysis.

The ordinary clinical history of the developed disease is somewhat as follows: The early symptoms are severe, constant headache, generally frontal, increased by movement, light, or noise, with intense darting paroxysms, causing the child to scream or cry out, and to hold the head; vertigo, giving rise to staggering and a tendency to cling to surrounding objects; alternate flushing and pallor of the face, the expression being often frowning or sad, or sometimes vacant and stupid; heat of head; marked intolerance of light and sound; general hyperæsthesia or dysæsthesia; great irritability and peevishness, with unwillingness to be disturbed, to answer questions, or take food; insomnia or very disturbed sleep; sometimes slight wandering at night, but no marked delirium; unsteady gait, with dragging of the limbs; constant restlessness; grinding of the teeth; alternate contraction and dilatation of the pupils; severe vomiting; usually obstinate constipation and retraction of the abdomen; complete anorexia without any particular thirst, the tongue being furred, and the breath offensive; moderate but irregular pyrexia, the temperature not being often above 101° or 102° in the evenings, the skin usually harsh and dry, the pulse rather frequent, but easily hurried to 120 or more, and the urine concentrated, but very deficient in chlorides, phosphates, and urea. Subsequently the mental faculties are more disturbed, as evidenced by delirium in some cases, either wild and restless, or muttering, and increasing drowsiness, with tendency to stupor; general sensibility is impaired, and the hyperæsthesia of the special senses ceases, while there are signs of implication of the cranial nerves at the base of the brain, such as dim or double vision, hemiopia, tinnitus aurium, and partial deafness, twitchings about the face, strabismus, oscillation of one or both eyeballs, dilatation, inequality or marked oscillation of the pupils, these being not very sensitive to light. The face assumes a worn, aged, distressed expression, the eyes being half closed. Vomiting ceases, and diarrhœa may set in. Fever diminishes, while cool sweats often break out, and the pulse becomes in many cases very *infrequent* and *slow*, but is extremely variable and fluctuating, often irregular in rhythm and force. Respiration becomes sighing or moaning and irregular. Still later there is marked general material disturbance, as evidenced usually by violent, prolonged, and frequent fits of convulsions, or by tetanic rigidity, the head being drawn back, boring into the pillow, or rolling from side to side, subsultus tendinum, tremulousness of the limbs, local paralysis or hemiplegia, or occasionally cataleptic phenomena. The face exhibits grimaces from the muscular twitchings, with partial paralysis; the eyes are half closed, dim, and covered with a film. When not convulsed the child is generally picking at the bedclothes, or boring the fingers into the ear or nostril. The pupils are dilated and motionless. The final symptoms are gradual anæsthesia of all the senses; deepening coma; general muscular relaxation, with slight twitchings; involuntary passage of urine and fæces; coldness of the extremities, with cold sweats; and an extremely rapid, feeble, and irregular pulse. Death may take place from gradual coma, or during a fit of convulsions. In some cases the temperature rises considerably before death, or it may sink much below the normal. The ophthalmoscope reveals hyperæmia, ischæmia, or optic neuritis, and, in very rare instances, tubercles have been seen in the choroid. Sometimes the head becomes enlarged, while the fontanelles are very prominent and throb if they are not closed up.

When tubercular meningitis affects only the convexity of the cerebrum, Gee states that the prominent symptoms are a constant convulsive state, with moderate pyrexia, and a pulse which is frequent and very variable in its frequency.

The ordinary *duration* of cases of tubercular meningitis in children is said to be from 7 to 23 days. Killiet states that when prodromata are wanting, it is from 20 to 30 days. When the convexity is involved the disease terminates in one or two weeks, or even sooner. In the course of a case a remarkable remission in many of the symptoms is frequently observed, simulating recovery, but some of them still remain, and it is very important not to mistake this improvement for a sign of convalescence.

In the adult tubercular meningitis is generally considered as being in most cases secondary to chronic disease, especially to pulmonary phthisis, the symptoms of which often improve markedly just before those of meningitis are developed. Gee states, however, that *primary* tubercular meningitis is at least as common as *secondary*. The symptoms more or less resemble those in the child, the most prominent being severe frontal headache with darting paroxysms; heat of head, with redness of the face, or alternate flushing and pallor, and suffused conjunctivæ, often a dull, bewildered, heavy, or stupid expression, with mental confusion, a tendency to somnolence and stupor, alternating with wild delirium; indisposition to speak, or sometimes sudden complete aphasia; photophobia and intolerance of sound; evidences of irritation or paralysis of some of the cranial nerves, as twitchings or paralysis about the face, ptosis, dilated or unequal pupils, strabismus, &c.; convulsive seizures; paralysis of the limbs; and cerebral vomiting. Severe coma sets in, with general paralysis and involuntary passage of fæces and urine, ending in death.

RHEUMATIC MENINGITIS.

The meningitis which occurs rarely in the course of acute rheumatism has been distinguished as a special variety, but it only requires to be just mentioned here. Its development is usually accompanied with a marked diminution in the joint-symptoms. The symptoms are those of simple meningitis, but it is said the early stage is less violent and the progress of the case more rapid. It must be remembered that grave cerebral symptoms arise in the course of rheumatic fever, independently of any meningeal inflammation.

ACUTE CEREBRITIS OR ENCEPHALITIS.—CEREBRAL ABSCESS.

ETIOLOGY.—Inflammation of the brain-substance may result from: 1. Injury to the brain-substance from fracture, wound, or mere concussion. 2. Disease of the bones, especially in connection with chronic ear affections, or occasionally acute disease of the internal ear. 3. Extension from meningitis. 4. Local irritation by adventitious morbid products, extravasated blood, or spots of softening. 5. Various acute and chronic diseases, especially if attended with suppuration, the inflammation being then probably pyæmia, or septæmic in character. Thus it has been met with in low fevers, especially typhus, acute pneumonia, chronic pulmonary phthisis, dysentery, or abscesses in different parts of the body. 6. Insolation. 7. Prolonged mental labor possibly. Sometimes no cause can be made out.

ANATOMICAL CHARACTERS.—Cerebritis is described as *diffuse* or *general*, and *local*. The former does not imply that the whole brain is implicated, which is never the case, but merely that there is extensive inflammation of the superficial gray matter, which is only associated with meningitis, evidenced by redness, softening, and adhesion to the pia mater, or this is stripped off. *Local cerebritis* is limited to one or more spots, of variable dimensions. Some pathologists regard this morbid change as being the invariable cause of *acute softening* or *ramollissement*, especially of *red* softening. As will be hereafter pointed out, however, it is far more likely that this condition is in the great majority of cases due to other pathological causes. When it is the result of inflammation, it is said that the specific gravity of the softened portion is increased. It is supposed that the color may become yellow or green from infiltration of the affected tissue with exudation or pus. The most important termination of local cerebritis is the formation of an *abscess*, which only occurs, however, in connection with injury, bone-disease, or pyæmia. Usually the abscess is single, but there may be several, especially in pyæmic cases. The white substance in the centre of the hemisphere is its most common seat, but any part of the brain may be involved, and when the abscesses are numerous, they are usually chiefly near the surface. The size varies, as a rule, from that of a pin's head to that of a nut or egg; but a hemisphere may be occupied by one large abscess, which alters in shape and flattens its convolutions against the skull. When there are several abscesses, they are usually small. The shape is irregularly round or oval. At first the walls are rugged, softened, or inflamed; but if the case lasts for some time a firm fibrous or fibro-cellular capsule is formed, which may attain a considerable thickness, becoming lined by a smooth membrane. The pus may be tolerably healthy, yellow or green, or sometimes red from admixture of blood; in old abscesses it becomes unhealthy, fetid, and alkaline, containing but few pus-cells, with abundance of granular matter. An abscess may burst in various directions, as on the surface of the brain, into a ventricle, nto the tympanum, or rarely externally. In other cases the contents become inspissated, cheesy, or calcified, and surrounded by a firm capsule.

SYMPTOMS.—The special characters of the clinical phenomena of cerebritis, as distinguished from those of meningitis, are, that they indicate but little and brief excitement, or none at all, while signs of failure of the cerebral functions speedily set in. The *diffuse* form is always preceded and accompanied by symptoms of meningitis, and in proportion as these are but little marked and of short duration, and the more rapidly stupor and coma, sensory anæsthesia, convulsions, and paralysis set in, the more probable is it that the brain itself is involved Pyrexia also is not so high. *Local* inflammation is always very obscure at the outset. Frequently there is a severe, prolonged rigor at first, which may be repeated on several days with almost regular periodicity. Sometimes, without any particular previous symptoms, the patient is seized with an apoplectic or epileptiform seizure, or gradual coma sets in; occasionally hemiplegia, without loss of consciousness, has been observed. As a rule, however, there are early symptoms, viz., deep and sometimes fixed headache, often considerable, and of a dull character, but not in violent paroxysms, vertigo, heat of head, restlessness, sleeplessness, a heavy expression, mental confusion, irritability, sometimes talkative, but not violent, delirium, dimness of sight, partial deafness, sensations in various parts of the limbs of tingling, numbness, formication, or sense of deep pain or coldness, general weakness and languor, with tremors, twitchings, rigidity, or paralysis of various muscles. The pupil presents all possible variations. There is comparatively little pyrexia. Vomiting is not infrequent. Sometimes articulation is impaired, or there is a disinclination to speak, or complete aphasia. The subsequent symptoms in fatal cases are stupor, ending in coma; gradual loss of all sensation; convulsions, hemiplegia, or general paralysis, usually with rigidity or tetanic spasms; and involuntary escape of urine and fæces. Some cases do not end fatally, but permanent disorder of the mental, sensory, or motory functions usually remains. In pyæmia it is rarely possible to diagnose cerebral abscess, and in some instances the symptoms closely resemble low fever. Very exceptionally a collection of pus in the brain bursts externally.

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CHAPTER LXII.

APOPLECTIC DISEASES.

It is necessary to make a few general observations respecting the condition known by the term "apoplexy." Originally this merely implied an attack of *sudden coma without convulsions*, corresponding to what is now called an "apoplectic seizure, fit, or stroke;" such a seizure, however, was found to be most commonly due to *cerebral hemorrhage*, and hence *apoplexy* came to be used as indicative of this pathological condition. Subsequently the word was employed to denote hemorrhage into any organ, *e. g.*, pulmonary apoplexy. Strictly this is quite incorrect, and it is important to bear in mind that *apoplexy* and *cerebral hemorrhage* are not synonymous, for the former may be due to other causes, and the latter does not always give rise to an apoplectic seizure. The comatose state characteristic of apoplexy is usually accompanied by other phenomena, such as an alteration in the color of the face; slow, labored, or stertorous breathing; abnormal states of the pupils; changes in the pulse; paralysis, &c.; but these are extremely variable and inconstant, and therefore cannot properly enter into its clinical definition. The chief causes of an apoplectic seizure are: 1. Cerebral congestion (*congestive apoplexy*). 2. Cerebral or arachnoid hemorrhage (*sanguineous apoplexy*). 3. Sudden anæmia of the brain, due to embolism or thrombosis of a main vessel; cardiac failure, especially from fatty disease, or probably vasomotor disturbance, leading to spasmodic contraction of the arteries. Rarely a sudden apoplectiform attack is associated with it. 4. Uræmia, and other forms of blood-poisoning. 5. Sunstroke. 6. Organic affection of the brain or its membranes, as meningitis, abscess, chronic softening, tumors. 7. It is said sudden serous effusion into the ventricles (*serous apoplexy*). The last, however, is very doubtful, and the cases in which it is supposed to have occurred were probably those of uræmic poisoning, though it must be added that some believe that uræmia may lead to cerebral symptoms by causing rapid effusion of serum. 8. In extremely rare instances, a fatal apoplectic attack has occurred, where no morbid condition whatever could be detected at the post-mortem examination (*simple apoplexy*). The immediate cause of an apoplectic seizure is a matter of dispute. Probably it may be due to a want of proper arterial blood in the brain, whether the result of interference with its entrance, venous engorgement, or a poisoned condition of the blood; compression, or actual destruction of the nerve-elements; or shock.

CEREBRAL CONGESTION OR HYPERÆMIA.

ETIOLOGY.—The causes of hyperæmia of the brain are—1. *General plethora*, especially from excessive eating or drinking, and luxurious habits with want of exercise. 2. *Increased flow of blood into the brain, active hyperæmia* from undue cardiac action, whether merely functional or associated with hypertrophy of the left ventricle; local irritation, especially in connection with inflammatory affections; diminished resisting power of the arteries, particularly in connection with *vaso-motor paralysis*, as from excessive mental labor, strong emotion, sunstroke, or the effects of alcohol and other poisons; interference with the general arterial or capillary circulation, in consequence of which an extra amount of blood flows into the main arteries of the neck; it is said atrophy of the brain. 3. *Interference with the escape of blood out of the brain—mechanical hyperæmia*—especially from cardiac and extensive lung affections; violent expiratory efforts, with the glottis closed, as in coughing, or straining at stool; hanging the head down; or direct pressure upon the veins returning the blood from the brain, as by an aneurism or other tumor, or strangulation of the neck.

ANATOMICAL CHARACTERS.—The post-mortem appearances usually described as indicative of cerebral congestion are overloading of the venous sinuses and of the vessels of the membranes, including the finer branches, as well as the larger veins, so that the pia mater appears extremely vascular and opaque; undue redness of the gray matter of the convolutions; and increased number and size of the drops of blood which are seen on making sections of the brain. The convolutions may be compressed, and the ventricles contracted. Niemeyer wrote at considerable length on this subject, and justly remarks that it is often difficult to decide whether the vessels of the membranes, and still more so whether those of the brain-substance, have been congested during life. He considered that the number and size of the drops of blood on section depend chiefly on its fluidity, and that œdema may result from congestion, so that the brain-substance becomes unusually pale and presents but few and small blood-spots. As a rule, the signs of hyperæmia are equally distributed throughout, but sometimes they are more evident in some parts than others.

Long-continued or repeated congestion leads to permanent enlargement and tortuosity of all the vessels, atrophy of the brain, with a moist, slimy condition of its substance, increase in the subarachnoid fluid, and it is supposed hypertrophy of the pacchionian bodies.

SYMPTOMS.—Cerebral congestion is revealed ordinarily by more or less of the following symptoms: Constant dull headache, not severe, felt all over the head, or chiefly at the vertex or behind; sense of heaviness, fulness, and oppression in the head; vertigo, which is often a prominent symptom; some degree of mental disturbance, evidenced by dulness of intellect; confusion and slowness of thought, impaired memory, indifference and indisposition for any effort or occupation; constant drowsiness, though sleep is unrefreshing, often disturbed by disagreeable dreams; photopsia, iridic colors, or specks before the eyes, or sometimes temporary diplopia or dim vision, partial deafness and noises in the head; sense of heaviness in the legs, especially after walking, with restlessness and fidgetiness, twitchings, or sudden startings, increased or impaired cutaneous sensibility, pains in the limbs, and various paræsthesiæ, these disordered sensations being temporary and variable in their locality. These symptoms are worse after meals, mental effort or emotion, physical exertion, and in the recumbent posture. There are often obvious signs of plethora about the face and head, with throbbing of the carotids.

Occasionally grave symptoms result from cerebral congestion. The most important are those characteristic of an *apoplectic attack*. Various combinations of symptoms are described, but the distinctive features of this *congestive apoplexy* are these: Its onset is quite sudden, it reaches its full development at once, and almost always follows some act on the part of the patient which leads to increased congestion in the head, as hanging down the head, coughing, straining at stool; the coma is rarely complete, there being usually signs of sensation, or if there is absolute loss of consciousness, this lasts but a very short time; there is generally partial *bilateral* motor paralysis, very rarely hemiplegia or more marked paralysis on one side; rigidity is never observed, but slight bilateral clonic spasms are not uncommon, or they may be unilateral; respiration is not stertorous; the pulse is generally slow, infrequent and full;

there are external signs of hyperæmia about the head and face; urine and *fæces* are not passed involuntarily; restoration is rapid and as a rule perfect, no permanent mental defect or paralysis of motion or sensation remaining. There may be some degree of mental confusion or *general* impaired sensation with muscular weakness left for a time, but these soon pass away. The patient may be subject to these attacks. Occasionally cerebral congestion gives rise to *epileptiform seizures*, and in some conditions it is attended with *delirium* and fever.

CEREBRAL AND MENINGEAL HEMORRHAGE—SANGUINEOUS APOPLEXY.

ETIOLOGY AND PATHOLOGY.—*Cerebral hemorrhage* is in the great majority of cases (excluding those of traumatic origin) the result of *structural changes in the minute vessels*, which diminish their resisting power, viz., atheroma or calcification, fatty degeneration, the formation of minute aneurismal dilatations on the small arteries, associated with a fibroid change in them, or the state of impaired nutrition which is induced by debilitating diseases, as typhus fever or scurvy. Frequently, in addition to this, the vessels are not properly supported, owing to softening or atrophy of the brain-substance, and they are therefore still more liable to rupture. Not uncommonly they give way spontaneously, but this event is far more likely to happen if congestion is brought about in any way, especially from hypertrophy of the left ventricle, excited cardiac action, or interference with the escape of blood from the brain. Therefore cerebral hemorrhage may follow sudden effort, straining at stool, a fit of coughing, strong emotion, hanging the head down, compression of the neck, exposure to the sun, a fit of drunkenness, a warm bath, exposure of the surface to cold, &c. Among *predisposing causes* may be mentioned advanced age, hereditary predisposition to early senile changes in the arteries, luxurious habits with want of exercise, and a state of general plethora and want of tone. If there are signs of marked degeneration in the arteries, particularly if combined with left cardiac hypertrophy or right dilatation and renal disease, cerebral hemorrhage is liable to occur at any moment. It must be mentioned that *embolism* or *thrombosis* of a large vessel in the brain will lead to capillary extravasation in the surrounding area. In very rare instances it has been found that hemorrhage into the brain has resulted from the rupture of a vascular tumor. *Traumatic injury* is the usual cause of meningeal hemorrhage, but blood may find its way into or beneath the pia mater, or into the arachnoid cavity from the brain. Another important cause of hemorrhage into the meninges is the *rupture of an aneurism on one of the main arteries at the base of the brain*, especially on the basilar, middle cerebral, or one of the communicating arteries. Effusion of blood outside the dura mater is always due to injury.

ANATOMICAL CHARACTERS.—The situations in which blood may be found extravasated within the cranium are as follows: 1. Into the substance of the brain. 2. Into the ventricles. 3. In connection with the pia mater. 4. Into the arachnoid sac. 5. Between the skull and dura mater.

The pathological anatomy of hemorrhage into the brain must be considered at some length. *Seat.*—By far its most frequent situation is the corpus striatum or optic thalamus. Occasionally it takes place into the pons, cerebellum, medullary substance of the cerebrum, crus cerebri, medulla oblongata, corpora quadrigemina, or corpus callosum. Sometimes a part of the brain, as the septum lucidum, is torn through, or the blood makes its way into a ventricle or out on the surface of the brain. *Amount.*—The quantity of blood extravasated varies from a few drops to several ounces, and the effusion may be so large as to alter the shape of a hemisphere, flatten the convolutions, and cause marked anæmia around. *Number.*—As a rule there is but one extravasation, but occasionally two or more are observed, though very rarely on opposite sides. Not uncommonly remains of former hemorrhages are seen. *Recent characters.*—The blood may accumulate as what is termed a *capillary hemorrhage*, or as a distinct *clot*. The former presents numerous scattered dark-red points of extravasation in the midst of cerebral substance, which is either normal or frequently of a yellow or reddish color, and softened, this condition constituting one form of "red softening." A clot, if small, simply separates the brain fibres, but if large, the cerebral tissue becomes broken down and mixed with the blood, while the surrounding portion is torn, as well as often softened and discolored from imbibition.

At first the blood may be quite fluid, or partially or completely coagulated into a soft clot. Subsequently it tends to set up inflammation around, and has been known even to give rise to an abscess. In favorable cases, however, the extravasation undergoes changes ending in its absorption. It separates into its fibrinous and serous portions, becomes decolorized by degrees, passing through stages of reddish-brown, brown, yellowish-brown, yellow; or granular pigment, with hæmatoidin crystals form. Proliferation of cellular tissue takes place around, forming a capsule, and the clot may in time be quite absorbed, an apoplectic cyst remaining often loculated, containing fluid, which may also be removed ultimately, nothing being left but a firm, fibrous, pigmented cicatrix. It is even said that this may disappear, a loss of substance with diminution in the size of the brain thus resulting. The nerve-fibres which lead from the seat of hemorrhage to the spinal cord often undergo degeneration.

When blood collects in a ventricle it is not nearly so readily absorbed, and frequently becomes organized. In connection with the membranes, an extravasation is generally spread out, and forms a soft red coagulum. In its subsequent changes it becomes altered in color, granular, and pigmented, the brain underneath being somewhat indurated. Finally it forms a depressed pigmented plate, with serum above.

The heart, vessels, and kidneys will be found diseased in many cases of cerebral hemorrhage.

SYMPTOMS.—In a considerable proportion of cases of cerebral hemorrhage, *premonitory symptoms* have existed for a variable period, such as headache or a sense of heaviness in the head, vertigo, mental confusion, impaired memory, irritability, disturbed sleep, or drowsiness, disorder of vision or hearing, thickness of speech, slight or temporary limited paralysis about the face or limbs, local twitchings, impaired sensation or paræsthesia in various parts. These may be due to mere vascular disturbance, minute thrombosis, or very small extravasations. The frequent occurrence of epistaxis has been considered an important premonitory sign, and also the discovery by the ophthalmoscope of clots in the retina. There are usually indications of degeneration of vessels, as well as in many cases of cardiac disease and chronic renal mischief.

The precise clinical phenomena which result from the actual extravasation of blood into the brain differ very materially. *This lesion never causes absolutely sudden death*, though in rare instances a fatal termination has occurred within a few minutes. In the majority of cases the immediate symptoms which characterize hemorrhage may be summed up as an *apoplectic seizure* with *hemiplegia*. The main features of the attack are as follows: It may either follow some evident cause which leads to cerebral congestion, but often sets in spontaneously, while the patient is perfectly quiet. The seizure is usually more or less sudden, though not absolutely so, being almost always preceded by some immediately premonitory symptoms, which occasionally last for some time, such as mental confusion, pain in the head, disorder of speech, unilateral numbness, pallor, with faintness or sickness. Sometimes a convulsion ushers in the attack. When fully developed the coma is usually very profound at first, and the deeper it is the more likely is an apoplectic fit to be due to hemorrhage rather than other cerebral lesions. The accompanying phenomena of the comatose state in a considerable proportion of cases are flushing or even some degree of lividity, with a turgical condition of the face and fulness of the veins; slow, labored, irregular, or stertorous breathing, with puffing out of the cheeks in expiration; throbbing of the carotids, the radial pulse being infrequent, slow, labored, full and soft. Sometimes, however, there are signs of shock, the face being pale, and the pulse rapid, small, and feeble. The temperature is frequently lowered. *Hemiplegia* exists on the side opposite the lesion, having the extent described in the chapter on paralysis, but in many instances it is not easy to make it out at first, when the coma is very deep, the whole body being paralyzed for the time. Sometimes tremors or spasmodic movements are observed in the paralyzed limbs. The head and eyes are usually turned to the *non-paralyzed side*, the patient seeming to be looking over the shoulder on that side, and often both upper eyelids fall. The pupils vary much, but they are generally equal and somewhat dilated; sometimes they are unequal, or very large and insensible to light.

As regards the progress of the case, the comatose state may end in death, which rarely happens under some hours, and not usually for two or three days. Some cases lingering for four or five days or longer. Urine and fæces are then passed unconsciously, and secretions accumulate in the air-tubes, causing loud rhonchal sounds. On the other hand, in a good proportion of instances consciousness is restored more or less speedily, and the mind is found to be perfectly natural, or there is only slight mental confusion, which soon passes off. Occasionally delirium is observed, or the mental faculties may be permanently enfeebled, the patient sinking in time into a state of more or less dementia. The *hemiplegia* becomes evident on the return to consciousness, and when the right side is affected there is often aphasia, which also occasionally accompanies left hemiplegia. Sensation is not nearly so much affected as motion as a rule, there being merely a certain degree of impaired sensibility or numbness and tingling in the extremities, and even these usually disappear before long. Now and then, however, permanent anæsthesia is observed, either over the whole side or in limited spots, which is an indication of severe lesion. There is usually no complaint of head-symptoms or disorder of the special senses, or if such exist, they speedily pass away, unless the hemorrhage is extensive. In a few days signs of more or less inflammation from irritation of the clot are generally developed, such as headache, heat of head, restlessness, slight delirium, disturbances of vision, twitchings, or spasmodic movements in the paralyzed parts. These soon subside as a rule, but violent inflammation may be set up, ending in extensive softening or abscess, indicated by a relapse into the comatose state, with general paralysis and involuntary evacuations before death, which event may take place from this cause in three weeks or more. Should the case be favorable, the motor paralysis often diminishes greatly in time, the improvement following the usual course, but the restoration is not often perfect, and certain muscles generally remain permanently disabled. In other cases there is little or no improvement, and in time "late rigidity" may set in.

Some of the chief clinical variations due to the extent and seat of cerebral hemorrhage will now be noticed. In the case of a cerebral hemisphere, the degree and duration of the comatose state depends mainly on the *amount of the extravasation*. Hence if this is moderate, there may be only partial loss of consciousness, the patient exhibiting signs of sensation and perception, while the mental faculties are very speedily and completely restored. If the hemorrhage is very small, there is no impairment of consciousness at all, and the lesion is merely indicated by *sudden hemiplegia*, or this is noticed when the patient attempts to move in the morning, the attack having occurred during the night. The degree and persistence of the paralysis depend on the *seat of the extravasation* as well as its extent. Thus a small effusion into a corpus striatum or optic thalamus will give rise to hemiplegia, and if it is of some size, the paralysis is permanent. Dr. Jackson thinks that the arm suffers less, and the leg more the further back the lesion is placed; and that when the optic thalamus is implicated, there is diminution, or soon after the attack, loss of sensation on the paralyzed side. A clot in any other part of the hemisphere may cause *no symptom* whatever, if small, and it is only accompanied with hemiplegia if it presses upon the central ganglia, and if it interferes with their supply of blood. Even then it is only partial, while recovery is frequently complete and rapid. Hemorrhage into the cortical substance is usually attended with convulsions, and subsequently by marked mental disturbance, meningitis being often set up. When a very large clot occupies a hemisphere, so that the opposite one is also interfered with, *bilateral paralysis* is produced, though it is not equal on the two sides, only some degree of weakness being observed on the same side as the lesion. *General paralysis* also results from extravasation into both hemispheres, but this is extremely rare. If there is extensive laceration of the brain, rigidity and muscular twitchings are prominent. At first there is in some cases no impairment of consciousness, or this is only partial and of brief duration, but afterwards, owing to increase of the hemorrhage, or the rupture of another vessel, profound coma may set in, ending in death.

Hemorrhage into the inner part of the *crus cerebri*, is signified by *paralysis of the 3d nerve* on the same side, with opposite hemiplegia. In *ventricular hemorrhage*, there is profound coma and general paralysis, with in some cases convulsions or marked rigidity and twitchings. Or more commonly these symptoms follow the signs of hemorrhage into one hemisphere, which is very significant. *Cerebellar hemorrhage* has exceedingly indefinite indications. *Very urgent* vomiting, severe pain at the back of the head, hemiplegia without implication of the face and tongue, have been considered its most characteristic signs. There may or may not be loss of consciousness. If one crus cerebelli is injured, one eye is turned up and out, the other down and in. Considerable extravasation into the middle of the *pons* causes profound coma, general paralysis, marked contraction of both pupils, and usually rapid death. The condition greatly resembles that of opium-poisoning. When the effusion takes place into one half of it, the facial, fifth, and sixth nerves may be paralyzed on the *same side* as the lesion, along with paralysis of the limbs on the opposite side; or if a certain part is involved, both facial nerves are affected. Sensation is frequently much impaired. Hemorrhage into the *medulla oblongata* is generally very speedily fatal. When blood escapes into the *arachnoid sac* or *subarachnoid space*, the attack is usually not so sudden, but the symptoms are very variable. At first there are frequently premonitory symptoms, as severe headache, vertigo, partial loss of motion, somnolence, or impairment of intellect. Among the signs which may be considered as most suggestive of this form of hemorrhage are coma, gradually developed; hemiplegia without implication of the face, or paralysis beginning on one side and afterwards extending to the opposite one; the occurrence of convulsions, marked spasmodic contractions or rigidity of the limbs; and the supervention of signs of severe meningitis in a few days. Sensation is rarely affected. When meningeal hemorrhage is considerable, it may be impossible to distinguish it from extravasation into the brain.

CEREBRAL EMBOLISM AND THROMBOSIS—SOFTENING.

ETIOLOGY AND PATHOLOGY.—The pathology of *softening of the brain* is much disputed, but I propose to treat of this morbid condition in connection with embolism and thrombosis, because it seems to me certain that it is in the great majority of cases due to vascular obstruction. In the great majority of cases a cerebral *embolus* of any size has its origin in *valvular disease of the* *heart*, but it may come from an aneurism, or a pulmonary thrombus. Minute emboli may also be detached from old clots, or from the inner surface of diseased vessels. The formation of *thrombi* is almost always associated with degeneration of the cerebral vessels, which, however, may be aided by a feeble state of the circulation, and certain conditions of the blood.

The main pathological causes to which the different forms of cerebral softening have been attributed, may be summarized thus: 1. Local inflammation of the brain-substance. 2. Obstruction of arteries or capillaries by emboli; of arteries, veins, or venous sinuses by thrombi. 3. Pressure upon a main artery by a tumor. 4. A diseased condition of the walls of the small arteries and capillaries, narrowing their calibre, and interfering with the nutritive relation between the blood and tissues. 5. Diminished nutritive activity in the tissue-elements, leading to their degeneration. 6. Effusion of blood into the brain. 7. A peculiar chemico-pathological change in the brain-substance, attended with the liberation of phosphine, and one or more of the fatty acids. This form of softening is said to be often observed around adventitious products and old clots, but occasionally is independent of these (Rokitansky). 8. Œdema of portions of the brain. 9. Atrophic softening, due to separation of nerve-fibres from their ganglionic communications. I have already expressed my own view as to embolism and thrombosis being by far the most frequent cause of cerebral softening, the nutrition of the part thus deprived of blood being impaired, sometimes to such a degree as to cause its actual death, œdema and capillary hemorrhage also in some cases aiding the process of softening. It must not be forgotten that the brain may become softened, as the result of a post-mortem change. With regard to *predisposing causes* of cerebral softening, it is most common in advanced age, on account of the condition of the vessels, but when due to embolism, it may be met with in young adults, or even in children. Excessive and long-continued mental strain undoubtedly aid in its production, and it is by no means improbable that this may so disturb the balance of nutrition, as of itself to give rise to softening.

Anatomical Characters.—An embolus may lodge in one of the arteries before reaching the circle of Willis, and then, owing to the collateral circulation being readily set up, no permanent evil consequences ensue. Almost always, however, it passes into a branch beyond this, most frequently the *middle cerebral artery*, especially the *left*. The immediate result is anæmia of the portion of the hemisphere which this artery supplies, and as its anastomoses are not abundant, this is followed by softening with œdema, while there is a determination of blood into the surrounding capillaries, and these often give way, giving rise to capillary hemorrhage, especially at the circumference of the affected part. The effects may partly disappear in time in young persons, in whom the vessels are healthy and distensible, and it is not improbable that the consequences of embolism in the minute vessels are often recovered from. After an embolus has been lodged for some time, it may be very difficult, or even impossible, to discover it.

In the case of *arterial thrombosis*, the vessels will generally be found extensively diseased, many of them being usually blocked up. This condition will also lead to anæmia and softening, but owing to the morbid state of the minute vessels, and to several of them being obstructed, there is no increased vascularity around the affected part, as a rule, this being very pale, while if a vessel of any size is obstructed, restoration cannot for the same reasons be expected. Thrombosis of the veins and sinuses is generally associated with inflammation from injury or bone-disease. It is said, however, that it may arise from feebleness of circulation, with blood changes, the thrombosis first forming in the superior longitudinal sinus, and then extending, giving rise to more or less effusion of serum into the ventricles and subarachnoid space, or rarely even to hemorrhage here or into the brain-substance, but especially to scattered patches of red softening, with capillary hemorrhages in the gray matter of the convolutions, or occasionally more extensive softening.

Coming now to the anatomical characters of *cerebral softening*, three chief forms are described, viz., *red*, *yellow*, and *white*, but the softened part may present numerous varieties of these tints, or other colors, as brown or greenish. The degree of diminution in consistence varies from what is scarcely appreciable to that of almost a fluid pulp. It is determined by touch, and by allowing a piece cut out of the softened part to stand, and observing how soon the angles round off, or pouring a gentle stream of water upon it. The seat and extent of softening vary greatly, and very different statements have been made as to the frequency with which different parts of the brain are involved, but the usual seats seem to be the corpus striatum, optic thalamus, central white matter of the hemisphere, and convolutions. In *embolic* softening, the *left* hemisphere is most commonly affected. The morbid condition is rarely well defined, but shades off into the surrounding brain-tissue. A section appears swollen, and often rises above the surrounding level. A highly important character of all forms of cerebral softening, except, it is said, the inflammatory, is that the specific gravity of the softened part is considerably below that of normal brain-substance. *Microscopical examination* reveals more or less destruction of the nerve-elements, until in extreme cases there is no trace of them; abundant granular cells, not of inflammatory origin, but chiefly derived from granular degeneration of the cells of the neuroglia, or of nerve-cells; granular fatty débris; particles of myelin; blood-cells in some forms, or their remains in the form of pigment, and hæmatoidin crystals. The capillaries often present signs of degeneration, and are in some forms dilated, or present little aneurismal swellings.

It is necessary to make a few remarks respecting the three main forms of softening. *Red softening* may be inflammatory, but in the great majority of cases it is due to obstruction of large arteries or venous sinuses. The tint at first may vary from pink to deep claret, being most intense in the gray matter. Afterwards it undergoes changes, assuming different hues of yellow, brown, chocolate, buff, &c. *Yellow softening* usually results from changes in the *red* variety, but the peculiar form due to the chemico-pathological change is of this color. *White softening* is considered by some pathologists as the ultimate condition of the red, but undoubtedly it is not uncommonly a primary form, especially in connection with extensive thrombosis and atheroma of the vessels. It is also observed in œdematous and atrophic softening.

Reparative processes may be set up after softening. On the surface of the brain circumscribed yellow patches (plaques jaunes) are produced, of tough consistence, implicating the gray matter of the convolutions. In the interior a cavity forms, bounded and traversed by a white or grayish, or sometimes yellowish vascular connective tissue, which may divide the space into loculi, and this contains a milky fluid, which holds in suspension abundant fat-granules and corpora amylacea. This fluid may be absorbed, followed by contraction and ultimate closure of the cavity.

SYMPTOMS.—It will be requisite in treating of the clinical history of cerebral softening, to describe it under the two forms of *acute* and *chronic*. The latter is considered in the chapter on Chronic Diseases of the Brain.

Acute Softening.—Practically it will only be necessary here to indicate the respective symptoms of *embolism of the middle cerebral artery* and *thrombosis*. *Embolism* may occur at any age, being not uncommon in young persons; some morbid condition likely to cause it can generally be discovered, while there have been no premonitory head-symptoms as a rule. The usual indications of the lodgment of the embolus are sudden loss of consciousness and evidence of shock, with hemiplegia generally on the *right* side. The case may end fatally, or consciousness may return, but the hemiplegia remains, aphasia being also very frequent. The paralysis is rarely recovered from entirely, but power may be partially restored, especially in young persons. In one case which came under my notice the leg recovered perfectly, but the arm, face, and tongue remained permanently paralyzed.

Arterial thrombosis is met with either in old persons or in those who are prematurely aged, and there are usually, but not always, well-marked signs of degeneration of the vessels in the limbs, along with a feeble heart and other evidences of decay. Commonly there have been marked *premonitory symptoms*, due to interference with the cerebral circulation or formation of minute thrombi, as described under Cerebral Hemorrhage. The mode of attack varies, but is usually more or less *apoplectiform*. Should a large artery or several smaller vessels be suddenly obstructed, a sudden apoplectic seizure occurs with hemiplegia, frequently not distinguishable from sanguineous apoplexy. By far more commonly, however, the onset is gradual, there being marked mental disturbance of some kind before the coma supervenes, such as transient excitement, confusion of thought, irritability, or mild delirium, the patient often talking incoherently or acting strangely. There may be complete loss of consciousness for a brief period, but this condition soon passes away, and almost always when the patient is seen the coma is only partial, there being indications that sensation and perception are not quite abolished. In some cases apoplectiform attacks are repeated, with partial restoration in the intervals, ultimately absolute coma being developed, with general paralysis and involuntary passage of fæces and urine, death occurring in a few days. In others the mental faculties become by degrees considerably improved, even up to the previous standard, but as a rule *the intellect remains markedly impaired,* and this condition tends to become speedily worse and worse. There is frequently permanent aphasia or defect of speech. When sufficiently restored the patient often gives indications of pain or uneasiness in the head, and of hyperæsthesia, dysæsthesia, or various paræsthesiæ in either or both limbs on one side. Hemiplegia is usually present, and during the apoplectic condition the head and eyes are often turned to the sound side. Sometimes the paralysis is bilateral or confined to one limb. It is not complete generally, being also more marked in the arms than the legs, and at the extremities of the limbs. Early *spasmodic contractions* in the paralyzed part are very common in the way of clonic spasms, jerkings, or rigid flexion of joints, especially of the shoulder, elbow, and knee. The affected limbs are often exceedingly irritable on percussion. The paralysis s not likely to diminish. *Hemiplegia without loss of consciousness* s far more common in thrombosis than in cerebral hemorrhage, and the paralysis may come on in a progressive manner, which is very characteristic, affecting first one limb and then the other, at the same time increasing by degrees. Occasionally the early ymptoms assume the characters of *irregular epileptiform attacks,* occurring in rapid succession, attended with mental disturbance, ending in coma and hemiplegia. In other instances *delirium* is he prominent symptom at first, usually mild, sometimes violent, alternating with and finally ending in coma. The subsequent course of cases of acute softening varies much; many of them become very chronic, the patient gradually sinking into a state of imbecility and being permanently bedridden and helpless, the opposite side becoming often weak, "late rigidity" setting in in the paralyzed muscles, and nutrition being much impaired.

CHAPTER LXIII.

CHRONIC DISEASES OF THE BRAIN AND ITS MEMBRANES—CHRONIC MENINGITIS.

ETIOLOGY.—Chronic meningitis is chiefly met with as the result of former injury to the skull; prolonged mental labor, especially if combined with much anxiety; chronic alcoholism; and irritation by tumors and morbid deposits, especially *syphilitic*. Rarely it remains after the acute disease. It is by far most common after middle age and in males.

ANATOMICAL CHARACTERS.—The most frequent post-mortem signs of chronic meningitis are thickening and increased firmness of the membranes in different parts, sometimes to an extreme degree, with opacity of the arachnoid; adhesion of the membranes to each other, of the dura mater to the skull, or of the pia mater to the brain; increased vascularity, particularly of the pia mater, with permanent enlargement of many vessels; serous effusion into the meshes of the pia mater, there being also sometimes a considerable quantity of turbid fluid in the subarachnoid space; exudation, especially in the sulci and around the vessels, often surrounding and pressing upon some of the cranial nerves, and becoming organized and firm; the presence of excess of serum, either clear or flocculent, in the ventricles, the lining membrane of which becomes thickened and rough. Calcareous or osseous laminæ may be found in the thickened membranes, and the convolutions of the brain are sometimes atrophied. Increase and enlargement of the Pacchionian bodies has been considered a result of chronic meningitis.

SYMPTOMS.—These are often very obscure and ill-defined, being a combination of those due to excited action and impaired function of the parts involved. The most important are: more or less constant general headache, of dull and heavy character, not severe, or attended with exacerbations; persistent vertigo, the patient staggering while walking, as if drunk, but particularly on looking suddenly round over the shoulder; mental excitability at times, especially in the evenings, with peevishness, irritability, restlessness and wakefulness, alternating with marked depression, the patient becoming apathetic, gloomy, low-spirited, and apprehensive; in course of time failure of the intellectual faculties, sometimes ending in extreme dementia; subjective sensations of flashes of light, iridic colors, tinnitus aurium, &c., with at the same time diplopia, or more or less impairment of sight in one eye, or partial deafness; hyperæsthesia of some part of the skin, with hypæsthesia or numbness of other portions; irregular twitchings or clonic spasms of various muscles, especially those of the face and eyeballs, causing grimaces and often external strabismus; also of the limbs, which may present curious spasmodic movements from time to time, or rigidity; irregular motor paralysis, usually incomplete, accompanying and following the above movements, affecting first the cranial nerves on one or both sides, indicated by partial ptosis, drawing of the face to one side, strabismus or immobility of the eyeball, slight deviation of the tongue and thickness of speech, then extending to the limbs, in some cases only a few fingers or certain muscles being involved, in others the whole arm, one arm and leg, or sometimes all the limbs more or less. Irregular epileptiform attacks not uncommonly occur, but they are not attended with any special cry, or stoppage of respiration and its consequences, while consciousness is not completely lost. The fit lasts an indefinite and often considerable time, and is not followed by the comatose state observed in true epilepsy. As a rule there is some pyrexia towards evening, with heat of head, flushing of the face, and conjunctival injection. Nausea and vomiting, with obstinate constipation, are not infrequent symptoms. Any excitement tends to increase the symptoms markedly. The ophthalmoscope often reveals neuritis or schæmia.

CHRONIC CEREBRAL SOFTENING.

SYMPTOMS.—It is only requisite to describe here the clinical history of softening, which is chronic from the commencement. Its chief symptoms are: 1. Headache in many cases, persistent but not severe, usually of heavy character, and it may only amount to a feeling of weight and heaviness, frontal as a rule, sometimes general, but never unilateral or localized. 2. Mental changes, viz., gradual failure of the intellectual faculties one after another, of which the patient is generally aware at first, which may ultimately end in complete dementia or mania; change in manner, disposition, and temper; various forms and degrees of aphasia, a tendency to repeat the same words several times, and on all occasions being considered very characteristic; marked lowness of spirits; emotional disorder, the patient being either apathetic or the emotions being but little under control, and the "quasi-hysterical" fits of crying or laughing, occurring without cause; sometimes a restless and excited manner at night, or even mild delirium. Occasionally the mind seems unaffected. 3. Sensory disorder, especially superficial and deep pains in various parts of the limbs, hyperæsthesia or dysæsthesia, formication, numbnesss, gradual impairment of sensation, rarely amounting to complete anæsthesia; some failure of sight and hearing, but rarely complete blindness or deafness. 4. Motor disturbance, in the way of paralysis, incomplete in degree and gradually developed, often in an intermittent manner, usually beginning in either arm or leg, but soon being more or less generally but irregularly distributed, though one side is, as a rule, more affected than the other, or sometimes confined to special groups of muscles, as those of the face, or part of a limb, frequently tonic rigidity, gradually increasing, tremors or clonic spasms, especially in the paralyzed muscles, with undue irritability on percussion; and sometimes epileptiform convulsions. The subjects of chronic softening commonly present an old or prematurely aged, unhealthy, cachectic appearance. Degeneration of the vessels, weak heart, and granular kidney are frequently well marked. Usually there is obstinate constipation. The duration of the disease is very variable. At last gradual coma sets in, usually with general paralysis and relaxation of the muscles, and involuntary passage of urine and fæces. Speedy and unexpected death may occur from extensive thrombosis or hemorrhage.

ADVENTITIOUS GROWTHS IN CONNECTION WITH THE BRAIN AND ITS MEMBRANES—CEREBRAL TUMOR.

ANATOMICAL CHARACTERS.—The chief morbid conditions to be enumerated here are—1. Cancer. 2. Tubercle. 3. Syphilitic deposit. 4. Sarcoma. 5. Myxoma. 6. Glioma. 7. Cholesteatoma. 8. Lipoma. 9. Parasitic cysts, viz., cysticercus cellulosus and hydatids. 10. Cysts containing fluid, fat or hair, or presenting cauliflower excrescences. 11. Aneurisms. 12. Vascular erectile tumor. 13. Osseous or calcareous masses. Only the anatomical characters of the first three will be described.

Cancer.—All forms are met with, but far most commonly encephaloid, which usually occurs as a more or less round or lobulated tumor of very variable size, generally single if primary, sometimes numerous if secondary. The growth may be inseparable from the brain-substance, distinctly defined or surrounded by a cyst. The usual seat of cancer in the brain is the cerebral hemisphere, but it may occupy any part. It often shows signs of degenerative changes in its interior. It must be mentioned that cancer may originate from other structures within the cranium besides the brain itself, and then tends in some cases to make its way outwards; on the other hand it may begin outside the skull and grow inwards.

Tubercle in the brain is described as occurring in the form of irregularly-roundish masses, yellow and caseous-looking, dry and bloodless, sometimes continuous with the brain-substance, through a grayish-white somewhat translucent border, in other cases separated by a cyst. As a rule there is but one collection, occasionally two, rarely more. The size generally varies from that of a hemp-seed to a cherry, but it may be equal to a small egg. The cerebrum and cerebellum are the usual situations of tubercles, rarely the pons. It often softens in the centre into a purulent-looking fluid, or an actual cavity may form.

Syphilitic Disease.—Syphilitic deposit is far more commonly met with in connection with the membranes than in the brain itself. These are matted together, the dura mater being closely adherent to the skull at the seat of disease, and the inner membranes to the cerebral substance, while there is more or less thickening from the accumulation of a tough material, yellow in the centre, but usually presenting a grayish-white border around. This often involves some of the nerves. In the brain, syphilis generally causes mere induration from interstitial proliferation of cellular tissue, especially at the surface. *Gummata* are extremely rare; they assume the form of irregular nodules or tumors, which may attain the size of an egg, their shape being often modified by the part of the brain in which they occur, and they always pass gradually into the surrounding tissue by a grayish softer material, or by indurated infiltration. A section is yellowish-gray or yellowish and translucent, cheesy or gluey in consistence, often presenting signs of decay in the form of opaque spots scattered over the entire surface, but there is no central softening such as is observed in tubercle. The more vascular parts of the brain are the usual seats of syphilitic gummata. Generally there is only a single deposit.

SYMPTOMS.—There is no disease of the brain in which the symptoms are more diverse in their characters and courses than in cases of tumor, so much depending on situation, size, shape, number, and rapidity of growth. They are further not only those due to its own mechanical results, but those of softening, hydrocephalus, and chronic meningitis are often added after a time.

Occasionally a tumor, even of considerable size, is quite latent throughout; or a sudden apoplectic attack, the result of congestion or apoplexy, reveals its existence. The characteristic clinical features of this disease, however, are as follows: 1. *Headache*, at first slight, but by degrees becoming *very severe*, often *localized*, though not necessarily, over the seat of the tumor, constant and of dull, grinding character, but *subject to violent exacerbations*, which may be accompanied with obstinate cerebral vomiting, the pain being often increased by any excitement, coughing, sneezing, a deep breath, or strong light. 2. *Marked vertigo* or a peculiar dizziness on movement in some cases. 3. *Absence of any mental disturbance*, in uncomplicated cases, unless the tumor is very large or rapid in its growth, or several occupy the cortical substance.

4. *Signs of irritation followed by gradual paralysis of such of the cranial nerves* as the growth implicates, these being generally *unilateral.* Vision is often affected, terminating in complete blindness, and it is not uncommon for one eye to be involved after the other. Smell and hearing may also be impaired or lost, the latter usually only on one side. Severe neuralgic pains, hyperæsthesia and paræsthesiæ frequently affect the 5th nerve, followed by gradual loss of sensation to anæsthesia, and paralysis of its motor portion occasionally. The facial nerve is most commonly implicated, next the 3d and 6th, and sometimes the 4th, there being first twitchings and spasmodic movements, followed by paralysis of the muscles supplied by these nerves; when the paralysis is complete, *electric irritability becomes usually quite extinct.* Partial paralysis of the 8th and 9th nerves is not unusual, causing impairment of speech and deglutition, or sometimes disturbance of respiration or cardiac action. 5. *Disorders of sensation and motion in the limbs.* These are, if present, as a rule of more or less *hemiplegic* distribution, and are observed on the *side opposite to that on which the cranial nerves are implicated.* Rarely they are bilateral, or they may be very limited. At first signs of irritation are observed, followed by gradually progressive paralysis, which is accompanied with spasmodic movement or rigidity. Electric irritability is not lost in the limbs. When a tumor occupies the interior of one cerebral hemisphere, there may be *pure hemiplegia.* Epileptiform convulsions are not uncommon, the convulsive movement being frequently localized mainly in some particular part. When a tumor occupies certain positions, peculiar rotatory and other movements are observed. The important ophthalmoscopic signs of cerebral tumor are those of ischæmia, descending neuritis, or atrophy of the disk. Occasionally a tumor becomes evident *externally.* In the case of an aneurism, it is said, a murmur has been heard. The *general condition* of the patient varies much. The constitution is affected gravely if there is much suffering, with loss of sleep. Sometimes considerable emaciation and marasmus, or evidences of some cachexia are observed, or cancerous, syphilitic, or tubercular deposits may be discovered in other parts. The mode in which cases of cerebral tumor terminate is very variable. In those which have come under my observation, the

end was always unexpected, acute symptoms setting in without any obvious cause.

CHRONIC HYDROCEPHALUS.

ETIOLOGY AND PATHOLOGY.—In this morbid condition there is an accumulation of fluid in the ventricles, in and beneath the arachnoid, or in both these situations. In the great majority of cases it is either *congenital,* or shows itself within six months after birth, and it has then been chiefly attributed to arrest of development of the brain, or to chronic inflammation of the ventricular lining membrane. It may come on as an *acquired* complaint, however, in older children, or very rarely even in adults, being then the result of closure of the venæ galeni, usually owing to pressure by a tumor. Chronic hydrocephalus has no connection with tubercle, but is not uncommon in rickets. Excess of fluid may accumulate in the arachnoid in connection with senile or other atrophy of the brain, or after previous hemorrhage.

ANATOMICAL CHARACTERS.—The quantity of fluid varies from a few ounces to several pints. It is usually watery, limpid, and colorless, of low specific gravity, containing but a very small quantity of albumen with some saline matter. The lining membrane is often altered in appearance, thickened, granular, and rough. The arachnoid is stretched, and there are often signs of chronic meningitis about the base. The brain is altered in shape, sometimes unsymmetrical, its convolutions being flattened and spread out, and its texture in many cases firmer than natural, or soft and macerated. The optic nerves are usually much stretched. The cranial bones are frequently expanded and thinned, the fontanelles and sutures being much widened; sometimes the bones are thickened but spongy.

SYMPTOMS.—Only the signs of chronic hydrocephalus as it is met with in children need to be considered here. The head enlarges in some cases to an enormous size, so that it falls from side to side if not supported, and assumes a curious shape, becoming round and globe-like, with a very large and prominent forehead, the bones being driven apart, while the orbital plates of the frontal are pushed down, especially behind, the eyeballs being thus pressed forwards so as to be very prominent, and to look downwards. The fontanelles and sutures are widened to a variable degree, and prominent, while there is frequently distinct fluctuation. The scalp feels thin, sometimes almost as if it were going to give way, and the bones may be so thin as to yield a crackling sensation. The lower part of the face looks very small, and has a curious worn or stupid expression. It may be puffy with enlarged vessels on the cheeks. The nervous symptoms which may be met with are headache, though this is often absent; vertigo; non-development or gradual failure of the mental faculties to complete imbecility; disturbed sleep at night, with drowsiness by day; marked peevishness, irritability or depression of spirits; failure of the special senses, especially that of sight, with signs of ischæmia or atrophy of the disk; restlessness, with general muscular weakness and loss of co-ordinating power, tottering gait, tremors of the limbs, spasmodic movements or convulsions coming on without any obvious cause; strabismus, or laryngismus stridulus. The body is generally much wasted, circulation is feeble, and the child always feels cold. Excessive appetite, vomiting, constipation, with unhealthy stools, are common symptoms. The duration of these cases is variable, but usually death occurs within the first few years of life, chiefly from gradual or sudden coma, exhaustion, convulsions, or laryngismus.

Hypertrophy of the Brain.

Only a few remarks are required concerning the so-called hypertrophy of the brain observed in children. This is associated either with rickets or congenital syphilis, and the increase in size and weight is probably due to *albuminoid infiltration* of the white substance, which becomes unusually firm, pale, and dry, the convolutions being compressed, flattened, and closely packed. The head expands, but the enlargement is distinguished from that of chronic hydrocephalus by being much less rapid in its progress, and never attaining any great size, by having an elongated form from before back, while the fontanelles and sutures are not at all or but little apart, the former being often depressed and not fluctuating, and the eyes are sunken; frequently there are no evident symptoms, but if the head is closed before the brain enlarges, serious symptoms arise, as severe headache, vertigo, mental failure, epileptiform attacks, paralysis, or coma.

CHAPTER LXIV.

DISEASES OF THE SPINAL CORD AND ITS MEMBRANES.

Clinical Characters.—The symptoms of affections of the spinal cord differ very considerably, according to the seat and extent of the disease. For instance, it may be involved high up or low down; at a limited spot, or extensively throughout its length; in its entire thickness or only in one or more of its tracts. A knowledge of the physiology of the cord will readily explain these variations. The usual indications of disease of the spinal cord are: 1. Local morbid sensations, or occasionally obvious objective changes. 2. Sensory and motor derangements in *both legs* and the lower part of the trunk, there being often complete sensory and motor *paraplegia*, with marked derangement as regards reflex and electrical phenomena, and a tendency to rapid failure of nutrition. 3. Paralysis of the bladder and rectum. 4. Sexual disorder, in the way of constant priapism, loss of sexual desire or power. If the cord is involved at its upper part, the entire trunk with the arms are implicated, while respiration becomes more or less disturbed. When only the posterior columns are affected, co-ordinating power over the muscles is lost. Mental disturbance or obvious signs of interference with the functions of the cranial nerves are not observed unless the disease extends to the brain, but there may be difficulty of deglutition, mastication, or speech in some forms of disease at the summit of the cord.

Acute Spinal Meningitis.

Etiology.—The causes of this disease are: 1. Traumatic injury. 2. Caries of the vertebræ. 3. Exposure to cold and wet, especially local; sudden changes of temperature, or to strong direct heat over the spine. 4. Acute rheumatism very rarely. 5. Adventitious deposits and tumors, especially syphilitic. 6. Tetanus, chorea, or hydrophobia, it is said. 7. Epidemic cerebro-spinal meningitis. 8. Extension from cerebral meningitis.

Anatomical Characters.—The post-mortem appearances resemble more or less those of cerebral meningitis. Usually the membranes are extensively affected, the pia mater being very vascular, infiltrated, and thickened. A soft exudation often covers its surface, as well as that of the arachnoid, while fluid occupies the subarachnoid space, either turbid and flocculent, or more or less puriform in appearance. This may be so abundant as to distend the dura mater considerably. The latter is frequently reddened, and there may be fluid between it and the bones, or it may exhibit signs of local injury or irritation.

SYMPTOMS.—Acute spinal meningitis is characterized at the outset by signs of irritation of the roots of the spinal nerves, followed by those of paralysis. The early symptoms are, severe paroxysms of pain along the spine, but only coming on *when the patient moves;* tenderness on deep pressure, but not very prominent as a rule; pains shooting from the spine into the limbs and trunk, but especially the legs, though sometimes they may be chiefly felt in the arms or even in one arm, if the inflammation is limited; some degree of hyperæsthesia; contraction of the posterior muscles, which may cause opisthotonos, usually regarded as being due to tetanic spasm, but also considered as an instinctive act to avoid "pain;" fits of painful spasm in the limbs, neck, and back, with involuntary startings and jerks, but not the powerful spasms observed in tetanus; some embarrassment of breathing, which is considerable if the respiratory muscles are affected with spasm, being attended with a sense of oppression and suffocation; occasionally some difficulty of mastication and deglutition, and irritability of the bladder. The attack may be ushered in with a chill, followed by slight pyrexia. The patient is usually very restless, anxious, and sleepless, but there are no head-symptoms. Afterwards muscular weakness is observed, beginning below and extending upwards, with partial loss of power over the bladder and rectum. In fatal cases death may occur from implication of the cerebral membranes, or from the cord being compressed by inflammatory products, or becoming itself inflamed.

CHRONIC SPINAL MENINGITIS.

But little is definitely known about this morbid condition. It is chiefly met with in connection with bone disease and adventitious growths, especially syphilitic; *anatomically* it may be revealed by thickening, induration, and roughness of the membranes; remnants of old inflammatory products; adhesions or bands passing across the subarachnoid space; and sometimes calcareous deposits. Syphilitic growths present the same characters as in the cerebral membranes.

SYMPTOMS.—These are described as slight pain over some part of the spine; severe pains in the limbs of a rheumatic character; paræsthesiæ in the legs, with gradually increasing hypæsthesia, but not complete anæsthesia; slight spasmodic movements in the limbs, followed by paralysis, beginning in the lower extremities and gradually extending upwards to the trunk, bladder, rectum, or even to the arms, at first slight, but increasing very slowly; persistent but subject to marked variations in its course. Ultimately there are all the signs of destruction of the cord.

ACUTE MYELITIS—INFLAMMATION OF THE CORD.

ETIOLOGY.—Acute myelitis may result from caries of the spine; injuries, including also severe strain and concussion; irritation by adventitious growths or clots; cold, or direct strong heat. It has also been attributed to suppression of perspiration or of chronic discharges, the sudden cure of skin disease, or sexual excess.

ANATOMICAL CHARACTERS.—Inflammation of the cord usually begins in the central gray matter, and may either extend along this from one end to the other, or be confined to one or more portions of the cord, spreading through its entire thickness, especially opposite the lumbar enlargement. The affected tissue is generally much softened, often of cream-like consistence; more or less reddened at first, but afterwards it may be yellowish; swollen and relaxed, the entire cord sometimes presenting a distended appearance or being nodulated on the surface, and the central gray matter having lost its contour. Sometimes there are small extravasations of blood. Very rarely an abscess forms. The microscope shows broken-down nerve elements, granules, or blood-cells, and granular or pus-corpuscles. There is always more or less meningitis. A form of myelitis is described in which the cord becomes indurated owing to fibrinous exudation. This has been considered by some pathologists as always preceding softening; by others, probably more correctly, as being the result of a less acute process.

Symptoms.—Myelitis is characterized by the absence of the signs of irritation of the nerves observed in meningitis, with rapid development of those indicative of destruction of the cord. Its special symptoms are described as slight pain over the spine, usually circumscribed, not increased by movement or moderate pressure, but intensified by kneading, and especially by *applying a hot sponge or ice*, which produces a burning sensation at the upper limit of the inflammation; a feeling of constriction round some part of the trunk, as if it were bound by a tight cord; marked paræsthesiæ in the limbs and trunk, but especially in the legs, such as tingling, formication, furriness, numbness, or subjective coldness, speedily followed by paraplegic or more extensive hypæsthesia or anæsthesia; marked restlessness, followed speedily by muscular paralysis below the seat of inflammation, therefore usually paraplegic; rapid loss of power over the bladder and rectum, not uncommonly accompanied with great irritability, the patient desiring to have the catheter passed very frequently; and constant priapism. In the paralyzed parts electric sensibility and contractility are usually impaired or lost; so, as a rule, is reflex excitability, but should the portion of the end below the seat of inflammation be healthy, it is exaggerated. When the myelitis extends high up, respiration is more or less impeded, the voice is weak, and there may be dysphagia or difficulty of speech. There is little or no fever. The disease may either soon terminate fatally, or pass into a more or less chronic condition. Occasionally the inflammation is limited to one-half, or to certain tracts of the cord, and the symptoms will be limited accordingly.

Chronic Myelitis—White Softening—Induration.

Etiology and Pathology.—Softening and induration of the cord may be considered together, as they produce the same effects clinically, and both may be produced by acute or chronic myelitis or gradual pressure. Softening may also be due to injury or failure of nutrition from degeneration of vessels. The softened cord is quite white in the degenerative form, or it may present a more or less red or yellowish color. Abundant granular corpuscles and granules are seen under the microscope. The sclerosed cord is often very hard, tough, pale, bloodless, and atrophied, especially its white matter.

SYMPTOMS.—If the cord becomes diseased slowly, the signs of this are more or less of the following character: Dull pain or uneasiness over some portion of the spine, increased by pressure, percussion, a hot sponge or cold, but not by movement; a feeling of tightness round the body; distressing paræsthesiæ, wandering pains, or fidgety sensations in the legs, followed by gradual loss of feeling to complete anæsthesia, this often extending up the body to a variable extent; twitchings, spasmodic movements, and cramps in the legs, with diminished power, dragging of the legs in walking, and a sense of heaviness, ending in paraplegia; frequently a strong tendency to painful contractions and rigidity in the paralyzed limbs, the legs being in many cases drawn up involuntarily if left to themselves, sometimes by jerks, so that the joints become strongly flexed, or one or both limbs being rigidly extended; increased reflex and electric irritability in the paralyzed limbs, provided the disease has not extended down to the roots of the nerves, but if these are involved the irritability is impaired or lost; rapid tendency to wasting of the muscles of the legs, with failure of circulation and nutrition, the skin being often covered copiously with dried epithelium scales, and bed-sores being very liable to occur; paralysis of the bladder, leading to retention, decomposition of urine and cystitis; paralysis of the rectum, with unconsciousness of the passage of stools; gradual loss of sexual power and inclination, though there is often reflex priapism. In rare instances the cord may be so extensively diseased as to produce general paralysis, with marked wasting of muscles, and loss of electric irritability.

SPINAL CONGESTION.

This condition is said to be characterized by a sudden onset of incomplete spinal symptoms, which afterwards disappear, but are liable to relapse, viz., some dull aching along the spine, increased by heat, but not by movement or pressure; aching pains in the limbs, with variable paræsthesiæ, as tingling in the toes and fingers, numbness, or sometimes hyperæsthesia, but no anæsthesia; twitchings in the limbs, with partial loss of power in the legs, or sometimes the arms, often unequal on the two sides, but no evident alteration in reflex irritability or in electric irritability or sensibility, or any tendency to wasting or other signs of impaired nutrition. The bladder and rectum are not involved. Slight motor and sensory disturbances accompany constant mechanical congestion of the cord, such as that which results from chronic heart disease.

SPINAL HEMORRHAGE.

Blood may escape into the cord itself, between the membranes, or outside the dura mater. Injury is by far the most frequent cause, but occasionally a vessel gives way spontaneously.

SYMPTOMS.—1. *Into the Cord.*—This is evidenced by *sudden acute* pain in the back, with signs of severe shock to the system, the patient being often unconscious; complete and permanent paralysis of motion and sensation in the legs or more extensively; paralysis of the bladder and rectum; and priapism. 2. *In connection with the Membranes.*—If the hemorrhage is abundant the symptoms are as above; but usually there are at first indications of sudden severe irritation, in the way of painful sensations shooting from the spine, hyperæsthesia, painful spasmodic movements in the limbs, opisthotonos, or even strong convulsive movements, followed by paralytic symptoms.

ADVENTITIOUS GROWTHS IN THE CORD.

Various tumors have been found in connection with the cord, but cancer, syphilitic deposit, and tubercle are the most important. The symptoms are localized pain in the back, especially in cancer, neuralgic pains, shooting from this point into the limbs or trunk, due to irritation of the nerves, with paræsthesiæ, followed by anæsthesia, if the cord becomes destroyed; muscular disturbance, followed by paralysis, in some cases beginning on one side, and extending gradually to the other. There may be objective evidences of tumor on careful examination. If the growth is in the cord itself, there will be only gradual loss of its functions up to the part involved. In the case of syphilitic disease the symptoms often improve greatly or entirely disappear under appropriate treatment, owing to removal of the deposit. Signs of some cachexia may be present, or of tumor in other parts.

LOCOMOTOR ATAXY.

ETIOLOGY.—The *exciting causes* of this complaint are very obscure. It has been chiefly attributed to exposure to cold and wet, especially when combined with fatigue, as from lying on the damp ground after marching, injury, syphilis, and venereal excess or masturbation. It is by far most common among males, and most cases occur between 35 and 50 years of age. Hereditary predisposition is said to exist occasionally.

ANATOMICAL CHARACTERS.—The lesion which gives rise to locomotor ataxy is localized mainly in the *posterior columns of the cord.* These undergo a peculiar degeneration, which begins close to the posterior fissure, and then spreads laterally, so as partly to implicate the gray cornua. In the early stage the columns appear gray or grayish-red, semi-translucent, and softened. Microscopic examination reveals that the nerve-elements are more or less atrophied, or have disappeared entirely, their place being occupied by new connective-tissue, developed from the neuroglia, exhibiting abundant nuclei, fine granules, and fat, with a few granular cells. The posterior roots of the nerves also become similarly altered. The change may advance gradually upwards into the brain. In time the new tissue replaces all the nerve-elements, and develops into filaments, so that the cord and nerves become more opaque, much atrophied and shrunken, altered in shape, and indurated or sclerosed. The membranes behind are implicated in time, and the entire thickness of the cord may become diseased.

SYMPTOMS.—Locomotor ataxy sets in insidiously, and runs a very chronic course. Certain *premonitory symptoms* occur, which may last for months or years. These may be arranged as—1. Sensory derangements in the legs and lower part of the body, viz., an unusual sense of fatigue after slight exertion; painful sensations in various parts of the limbs and about the joints, from time to time, supposed to be rheumatic, and also *sudden*, *extremely severe neuralgic pains of momentary duration*, described as darting, boring, cutting, throbbing, like an electric shock, &c.; hyperæsthesia, dysæsthesia, or paræsthesiæ of the skin. 2. *Disorder of vision, and objective changes in connection with the eyes*, such as dimness of vision at times, or even complete amaurosis, diplopia, slight strabismus or ptosis; atrophy of the disk, or chronic neuritis. 3. *Sexual derangement.* It is said that sexual desire is usually increased at first. Trousseau states that there is in the early period a peculiar aptitude for repeating sexual intercourse a great many times within a short period. Soon, however, sexual power and desire are gradually lost. Spermatorrhœa is frequently complained of. 4. In some cases there is a *difficulty in retaining the urine*, the patient being obliged to obey the call to urinate instantly; or, on the other hand, retention has been observed.

When the disease is fully developed, the symptoms are very characteristic, and chiefly point to a *loss of the power of co-ordinating the muscles of the legs, and of the muscular sense.* At first the patient feels that he is losing control over the movement of his legs, and that he cannot walk steadily or firmly without support, but slips about, and has an uncertain gait. This is especially noticed in the dark, and the patient finds he has to pay attention to the movements of the legs, in order to carry them on properly. In time the signs of impaired co-ordination are very evident, when the patient is made to walk. He is very unsteady in his movements, tends to stagger and advance precipitately, and during progression lifts the foot up to an unnecessary height, then throws it forwards and outwards, and brings down the heel with a heavy stamp. On turning suddenly, he staggers or falls, and the same is the case if he shuts his eyes when standing. There is no paralysis, as is shown by the legs being easily moved in all directions in the lying posture. At last walking is impossible, the legs being thrown hither and thither, without any appearance of design, when any attempt at movement is made. The muscles do not waste. The condition of electric irritability is doubtful, some affirming that it becomes much impaired, others that it remains normal; in the early stage it is often exalted. Sensation is frequently much altered; the pains in the limbs continue, cutaneous sensibility is impaired, the patient not feeling the floor properly, but having a sensation as if he were treading on wool or sand, and sometimes there are spots of complete anæsthesia to all stimuli, except heat and cold. Muscular sense is also more or less diminished, or even lost, in advanced cases, the patient not being aware of the position of his legs when lying down, unless he is looking at them. The electro-sensibility is said to be impaired in those muscles in which the muscular sense is affected. There is no loss of power over the bladder and rectum, as a rule, but the former may certainly be much affected.

In some cases the ataxic condition spreads to the arms, head and neck, and trunk. Not uncommonly there is ptosis of one eye, and there may be more or less complete amaurosis, with atrophy of the disk. These conditions result from extension of the disease to the origin of the nerves. Now and then there is mental disturbance. Ultimately the entire cord may become involved, so that there is actual paralysis of the lower part of the body, with implication of the rectum and bladder.

CHAPTER LXV.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF ORGANIC NERVOUS DISEASES.

In considering this subject it will be convenient to divide the cases into groups, each presenting certain clinical phenomena in common which separate it from the rest.

Diagnosis.

1. The first matter to determine in any case of organic nervous disease is, whether the lesion is *cerebral*, *spinal*, or *peripheral*. The general clinical characters of cerebral and spinal diseases respectively have already been pointed out, and they can usually be distinguished from each other readily, if attention is paid to

them. It must be remembered that both the brain and cord may be involved. Peripheral disease is generally easily recognized by the localization of the symptoms and the existence of some obvious cause. Local nervous phenomena may, however, be the result of limited or commencing central disease. The use of *electricity* affords much aid in recognizing the seat of lesion in case of paralysis, as explained in a previous chapter.

2. The diagnosis of affections of the brain and its membranes will be considered next.

(i.) *Acute Inflammatory Diseases.*—*a.* These have to be distinguished from various *extrinsic* diseases attended with severe nervous symptoms, and this applies particularly to *tubercular meningitis occurring in children.* The principal affections of this class with which they may be confounded are *acute exanthemata,* especially typhoid and typhus fevers; pneumonia and other acute inflammatory affections; disorder of the alimentary canal in children, particularly if acute and attended with fever and marked cerebral disturbance; anomalous cases of fever, with brain-symptoms (brain fever); great exhaustion of the vital powers, especially as the result of bad feeding, prolonged diarrhœa, or some lowering illness; and various derangements giving rise to reflex convulsions or delirium. The history of the case, as revealing some cause of cerebral inflammation or of one of the other complaints; age, constitutional condition, and hereditary tendencies of the patient; mode of onset of the attack; careful examination into the symptoms, particularly as to the degree and character of those referable to the head, and the presence or absence of indications of cerebral lesion, in the way of motor or sensory disorder, the intensity and course of pyrexia, the symptoms connected with the alimentary canal, and those characteristic of the various fevers; physical examination of the different organs; and the course and progress of the case, are the chief points to be relied on in diagnosis. It is frequently impossible at first to tell in the case of children whether they are suffering from tubercular meningitis or one of the complaints above mentioned. Under such circumstances the only thing to be done is to watch the case carefully and observe its progress, at the same time employing some judicious treatment, and the difficulty will in most instances be cleared up before long. *b*. Inflammatory diseases have to be separated from other affections of the nervous system, which give rise to signs of cerebral excitement. *Acute meningitis* in an adult may be simulated by *active congestion,* in which, however, the symptoms are but temporary and usually slight, with little or no fever; *delirium tremens;* or *acute mania.* In the last two conditions there is rarely much difficulty, if proper attention be paid to the previous history and the symptoms present. In mania the existence of one or more fixed delusions, and absence of fever or of signs of vascular excitement about the head are important in diagnosis. In doubtful cases the supervention of spasmodic and paralytic phenomena or of coma usually soon reveals the existence of meningitis. *Meningeal hæmorrhage* and *cerebral tumor* have in rare instances been mistaken for tubercular meningitis. The symptoms of *acute inflammatory softening* and that due to *thrombosis* often closely resemble each other, and occasionally *hemorrhage* simulates *cerebritis* at first. *c.* The diagnosis of *meningitis* from *cerebritis* and its consequences, and of simple from *tubercular meningitis* calls for a few remarks. Meningitis and cerebritis are frequently more or less combined, but the latter is distinguished mainly by the symptoms of cerebral excitement being much less marked and of short duration, or even absent altogether, while those indicative of failure of the cerebral functions rapidly supervene; there is also much less local vascular excitement and general pyrexia. The chief circumstances by which *tubercular* is distinguished from *simple meningitis* are, the age of the patient in many cases; the presence of signs of the tubercular diathesis or a history of the hereditary taint; and absence of any other obvious cause of meningitis; more marked and prolonged premonitory symptoms, with insidious onset; evidences of inflammation, chiefly *at the base,* at first with less psychical disturbance, there being no *wild delirium;* headache, more in severe paroxysms; less fever or local vascular excitement; the special characters of the pulse; less rapid course.

(ii.) *Apoplectic Diseases.*—These constitute a most important class of cases. The comatose condition may either be developed more or less suddenly while the patient is under observation; or he may be found in an unconscious state. The first thing to be determined in a case of insensibility of which the cause is unknown is whether this is due to *syncope* or *shock*, *asphyxia* or *coma*. The characteristic features of each of these conditions have been already described and need not be further alluded to here. The ordinary causes acting directly on the nervous system, which are to be borne in mind in explanation of unconsciousness, the origin of which is not evident, are—*a*. Injury to the head. *b*. Epileptic or other convulsive seizures. *c*. Uræmia. *d*. Poisoning by alcohol or opium. *e*. Sunstroke. *f*. Certain organic affections of the brain or its membranes, viz., congestion; hemorrhage into the brain, or meninges; embolism or thrombosis, or rapid serous effusion.

In endeavoring to arrive at a diagnosis, the following course should be pursued:

1. Inquiry must be made as to the mode of attack, and if there is any known cause of it. Thus there may be a history of injury, opium-poisoning, or alcoholism. On the other hand, the circumstances under which the seizure occurs may exclude these altogether, but it is important to bear in mind that symptoms of opium-poisoning may not appear until some time after the poison has been taken. In many cases, however, the patient is found in a state of insensibility, and no history can be obtained. If this happens in a house, it is requisite, in any suspicious case, to look for bottles which might have contained poison. If the attack has come on under observation, it is very important to ascertain whether it came on spontaneously or followed some obvious cause, as sudden effort or a fit of anger; whether it was *sudden* in its onset, or more or less *gradual*, and if preceded or not by mental disturbance, local sensory or motor disorder, or other symptoms; and if any convulsive movements were observed at or soon after the beginning of the attack. This information gives much aid in distinguishing organic lesions from each other, while the occurrence of convulsions entirely excludes poisoning. The age of the patient should be ascertained if it is known.

2. Next, careful examination of the patient must be made, noting especially the following particulars: The apparent age, general conformation and appearance, whether full and plethoric or the reverse, and if there are marked signs of decay; the color

of the face, whether indicating congestion or shock; if any signs of injury about the head can be discovered; whether there are any indications that the attack began with convulsions, such as the tongue being bitten; the odor of the breath, which may reveal alcohol, opium, or uræmia; the degree of insensibility, *deep* coma usually indicating hemorrhage or poisoning; the state of the pupils, any inequality showing some cerebral organic lesion, while extreme contraction is a sign of opium-poisoning, though the same condition is now and then observed in cerebral hemorrhage, while the pupils are greatly dilated at the close in cases of opium-poisoning; if there are any evidences of *unilateral motor disorder*, looking especially for paralysis, turning of the head and eyes to one side, tremors, spasmodic movements or rigidity, these affording proof of some cerebral lesion, though their absence does not exclude this, while marked spasm or rigidity is in favor of plugging of vessels or meningeal hemorrhage; the character of the breathing. slow, labored, and stertorous respiration being usually only observed in the profound coma of cerebral hemorrhage or narcotic poisoning; the state of the pulse. It is highly important to *examine the heart and vessels*, valvular disease or some other condition likely to give rise to embolism may be thus discovered. Cardiac enlargement is often associated with cerebral congestion or hemorrhage; while in cases of thrombosis the heart is usually very weak or fatty; very degenerate vessels may accompany either hemorrhage or thrombosis. The *urine* should also be tested, and some may be removed by the catheter if necessary. Bright's disease, however, may be associated with uræmia, cerebral hemorrhage, or thrombosis. The detection of alcohol in the urine has been considered useful in the diagnosis of alcoholism. If the patient vomits, the matter vomited ought to be examined in any doubtful case, and it may be even desirable to use the stomach-pump.

3. The progress and issue of a case often gives much information as to its nature. Thus opium-poisoning and hemorrhage on a very extensive scale or into certain parts soon terminate fatally. In a considerable experience of cases of alcoholic poisoning at the Liverpool Northern Hospital, I never knew one terminate fatally, even when the coma was very deep. The course of a

case affords important help in distinguishing between cerebral congestion, hemorrhage, and plugging of vessels.

There are some points of practical importance which demand notice. The greatest care should be taken not to pronounce a person merely drunk, in whom there are signs of this condition, as there may be at the same time some serious injury to the head or organic lesion in the brain. Grave mistakes have not infrequently been made in this matter. Alcoholic poisoning may be met with in very young children, even in infants. It is sometimes difficult or impossible to tell whether comatose symptoms are due to some evident injury to the head, or to a sudden cerebral lesion which has caused the patient to fall, and has thus led to the injury.

(iii.) The occurrence of *sudden or rapidly developed hemiplegia without loss of consciousness* indicates either hemorrhage into the brain or plugging of vessels. The probability is always in favor of the latter, and the diagnosis is still more certain if the paralysis is not suddenly complete, but increases and extends in a progressive manner.

(iv.) *Chronic Organic Affections of the Brain and Meninges.*—Not uncommonly head-symptoms are complained of more or less constantly, such as headache, giddiness, &c., and it becomes a question whether these depend upon some extrinsic disturbance, especially connected with the digestive organs, heart or kidneys, or upon some morbid condition of the brain, such as congestion or disease of the nerves. It is always well to give a cautious opinion in these cases. The general condition of the patient; presence or absence of marked symptoms referable to the alimentary canal; state of the heart, vessels, and kidneys; and the precise nature of the symptoms complained of will usually clear up the diagnosis. Any sensory or motor disorder in the limbs, especially if *always on one side or fixed in the same spot,* should be looked upon with suspicion.

The principal chronic cerebral diseases between which a diagnosis has to be usually made are, *chronic meningitis, softening,* and *tumor.* It must be remembered that these are often associated together, when these symptoms are more or less combined. The chief points to be considered in the diagnosis are: 1. The history of the case, as revealing some local cause of meningitis, or a *syphilitic taint;* or the *absence* of any such cause. 2. The age, general condition, and state of the main organs and vessels, *softening* being generally accompanied with signs of marked degeneration, and occurring in old persons, or those prematurely aged. There may be signs of some constitutional taint associated with *tumor*, or of morbid deposits in other parts, especially cancerous, tubercular, or syphilitic. 3. The seat, intensity, and characters of headache. 4. The mental condition, *meningitis* being chiefly characterized by excitement, alternating with depression, and *softening* by gradual and permanent impairment of the mental faculties, while in *tumor* the mind is often quite natural. 5. The character and mode of distribution of sensory and motor disturbances. These have been pointed out in the description of the symptoms of each disease, and they are very important. 6. The appearances revealed by the ophthalmoscope. As to the *nature* of a *tumor* in the brain, it is often impossible to come to any certain conclusion. Some indications may be derived from the age of the patient, signs of some cachexia, or of morbid growths in other parts. 7. Occasionally there are external objective signs of *tumor*.

Epileptiform seizures may occur in the course of the diseases just considered. These can generally be distinguished from true epileptic fits, by their irregular character, and by the existence of symptoms indicative of one of these morbid states.

The differences between *chronic hydrocephalus* and *hypertrophy of the brain* in children, each of which causes enlargement of the head, have been previously pointed out.

(v.) The determination of the exact *seat* of any organic lesion in connection with the brain or its membranes is often very difficult, requiring careful consideration of all the clinical phenomena observed; the ophthalmoscope often affords such aid. This subject has been treated in the preceding chapters, so far as was practicable in a work such as this. Probably, as the result of experiments now being carried on, with the view of fixing more clearly the functions of different parts of the brain (notably those of Dr. Ferrier), as well as of careful and extended clinical observation, the time will come when the situation of a cerebral disease may be made out with much accuracy. My friend, Dr. Gowers, has drawn my particular attention to the necessity of *testing the field of vision* in order to localize a cerebral lesion. For instance, *partial double hemiopia* is often present when unsuspected by the patient. This shows disease of the optic fibres *on the side opposite to the hemiopia*, behind the commissure, or of their terminations in the central ganglia, corpora geniculata, or optic thalamus. Hence when other nervous symptoms are bilateral, this hemiopia may afford the only indication as to the side which is affected, and it may be the means of still further localizing the mischief to that part of the hemisphere contiguous to the optic tract and ganglia. If the lesion is situated in the commissure itself, which is very rare, the loss of vision is not on the *same side* in both eyes, but the two outer or two inner fields are lost.

4. The diagnosis of *diseases of the spinal cord and its membranes* needs but brief notice. *Acute meningitis* may be mistaken for tetanus, spinal congestion, or spinal irritation, but there is rarely any difficulty in separating them. *Myelitis* is distinguished from *meningitis* by the absence of symptoms of irritation, with rapid occurrence of signs of destruction of the cord and failure of its functions. *Chronic affections* of the cord may be simulated by hysterical or reflex paraplegia. The characters of the former have been already pointed out. In *reflex* paraplegia some cause can be discovered, the paralysis being in proportion to this, and generally partial and incomplete; there is no wasting of muscles; usually sensibility is normal; and the bladder and rectum are but little or not at all affected. The paralysis disappears if the cause is removed. *Chronic softening* is, as a rule, easily recognized by the local sensations, and permanent paralytic and other symptoms. *Syphilis* is a most important cause of spinal disease, and where there is a history of a syphilitic taint, treatment directed against this should always be had recourse to, when the symptoms, if due to syphilitic deposit, are either greatly improved or entirely got rid of. The signs of other adventitious growths, hemorrhage, &c., have been sufficiently indicated in the account already given of these morbid conditions. *Locomotor ataxy* is usually easily recognized by the history of the case and signs of loss of co-ordinating power without paralysis.

Prognosis.

1. Any *acute inflammation* in connection with the brain or its membranes is extremely dangerous, and the great majority of cases end fatally. It is exceedingly doubtful whether *tubercular meningitis* is ever recovered from, at all events when it is fully developed. If a case should end favorably, the cerebral functions are permanently affected more or less.

2. The *immediate prognosis* in *apoplectic seizures* due to cerebral lesions varies much, and a very cautious opinion ought always to be given, the case being thoroughly watched. If the coma is merely due to *congestion*, the patient will soon recover. The chief circumstances which increase the gravity of the immediate prognosis in cases of *hemorrhage* are: advanced age of the patient, with very degenerate vessels; a history of previous attacks; the occurrence of convulsions at the outset, or of marked rigidity or spasmodic movements at an early period; a progressive character of the attack; very deep and prolonged coma, with involuntary passage of urine and fæces; general paralysis; great dilatation and immobility of the pupils, or extreme contraction; a very slow or rapid pulse; signs of profound shock, with feeble circulation, pallor, cold sweats, &c. As to the ultimate prognosis, supposing consciousness to be restored, this can only be determined by watching the case for some time and noting its progress; and the same is true when hemiplegia sets in without coma. Right hemiplegia is said to be less favorable than left. Anæsthesia in any part of the paralyzed limbs is a bad sign, also the occurrence of occasional severe pains. If there is no improvement within a month, if the paralyzed limbs show a marked tendency to permanent rigidity, and if electric irritability becomes impaired or lost, the prognosis is very unfavorable. The leg may recover power, while the arm remains permanently paralyzed. After hemorrhage the mental faculties are often quite restored, though the paralysis is persistent. It must be borne in mind that a clot in the brain may cause serious inflammation of its substance, and thus prove fatal some time after the occurrence of the hemorrhage.

Embolism or thrombosis is not so frequently speedily fatal as hemorrhage, but the subsequent history is generally very unfavorable, both as regards the mental condition and the paralysis, especially in cases of thrombosis, where the vessels are much diseased, these often going on rapidly from bad to worse.

3. In *chronic brain affections* the prognosis is very uncertain. All that can be said is, that it is always serious, and that at any moment dangerous symptoms are liable to arise, which may end in speedy death. If the disease is due to *syphilis* much good may often be effected, however, by proper treatment. If there are indications of constant disorder of the cerebral circulation, with degeneration of the vessels, the danger of the occurrence of hemorrhage or thrombosis should be recognized.

4. *Acute inflammation of the cord or its membranes* is also very grave, and often proves rapidly fatal, but myelitis may remain as a chronic affection. Once the cord is destroyed by any acute or chronic disease, there is permanent paralysis in the parts below the seat of lesion, but cases of this kind frequently linger a long while, and the patient may enjoy good general health. Bedsores, cystitis, and other untoward complications, are very liable to arise, however. Symptoms due to *syphilitic disease of the cord* improve greatly under appropriate treatment in many cases. *Locomotor ataxy* is not usually amenable to treatment when fully established, but in early cases much good may be done. Its progress is very slow.

TREATMENT.

1. *Of Acute Meningitis and Cerebritis.*—Unfortunately direct treatment is of very little service in these diseases, and my own experience of a good number of cases at the Liverpool Northern Hospital is decidedly opposed to the measures recommended by some high authorities, viz., bleeding, severe purging, mercurialization, and extensive blistering. The measures which are most likely to be useful in the early stage are, to place the patient in a well-ventilated, cool, quiet, and somewhat darkened room, in a comfortable bed, with the head high; to enjoin perfect freedom from every kind of disturbance; to cut the hair very short, or shave the head, and apply cold assiduously but cautiously by means of the ice-bag; or irrigation; to open the bowels tolerably

freely, a dose of calomel or croton oil being useful for this purpose, and also enemata; to limit the diet to beef tea and milk; and if there are signs of vascular excitement, to apply a few leeches over the temples. Convulsions are best treated by bromide of potassium in full doses, especially in cases of tubercular meningitis. Opium must be avoided. In the later stages a blister may be applied to the nape of the neck, or a couple behind the ears, but the advantage of blistering the whole scalp, as has been advocated, seems to me very doubtful. Should there be symptoms of adynamia, stimulants are needed, especially brandy, ammonia, and ether, with abundant liquid nourishment, and if the patient is unconscious, they may be injected between the teeth, by means of a syringe, or administered by enemata. Care must be taken throughout to keep the feet warm, to attend to cleanliness, and see that the bladder is properly emptied. Sinapisms and flying blisters over the limbs are recommended to endeavor to rouse the patient in the later stages, but they are not of much use. Should meningitis arise in connection with rheumatic fever, application of sinapisms or blisters to the joints might be of service.

2. *Of Apoplectic Diseases.*—Here it is only intended to consider the treatment of an apoplectic attack from some organic cause, but I would just remark that in cases where the diagnosis is uncertain, it is desirable to empty the stomach at once, by means of the stomach-pump, lest the symptoms should be due to some poison. In this class of cases, the first principle in treatment ought to be, *not to interfere immediately unless there is some clear indication for this.* Formerly venesection was at once resorted to, and is now but too often followed as a routine practice. In many cases all that is necessary is to place the patient in the recumbent posture, if possible in bed, with the head high; loosen all clothing about the neck and chest; allow plenty of fresh air, and enjoin perfect quiet. If the attack is merely due to congestion, recovery will soon follow. Should the case be one of hemorrhage, and there are signs of marked plethora, unquestionably venesection may be useful, but it is rarely needed; on the other hand, the condition may be one of shock, and then stimulant enemata, heat, and sinapisms to the extremities, and such measures are indicated, particularly when the coma is due to plugging of vessels.

The practice of placing a drop or two of croton oil on the tongue is useful in many cases. If the comatose state continues long, the patient must be supported, sinapisms applied to various parts, and the bladder attended to. If consciousness returns, the patient must be kept completely at rest, free from all mental disturbance, and upon low diet, until the period of danger from inflammation has passed. Should this condition be excited, the hair may be cut, and cold applied, or small blisters. The subsequent treatment of these cases, as well as those of sudden hemiplegia only, must depend upon their progress. The main principles are to support the general health, especially by proper diet, and hygienic conditions, and tonics; avoid all forms of mental disturbance, and treat symptoms, particularly paralysis. Iodide of potassium and bichloride of mercury have been supposed to aid in the absorption of a clot. A blister occasionally applied to the nape of the neck may be useful.

3. *Of Chronic Cerebral Diseases.*—The principles of treatment in these affections are very simple, viz.: *a.* To keep the mind free from every possible excitement or anxiety, and forbid any mental labor: in short to keep the brain as much *at rest* as possible. *b.* To support the general health by good food, fresh air, quinine, iron, cod-liver oil, and hypophosphites. *c.* To aid absorption of morbid products, iodide of potassium, bichloride of mercury, and hydrarg. c. cretâ are given in cases of chronic meningitis, and they are especially important in syphilitic disease. Occasional blisters are also supposed to promote absorption. *d.* To treat symptoms, especially headache, paralysis, restlessness, and sleeplessness, by hyoscyamus, cannabis indica, or chloral; and convulsive seizures, by bromide of potassium. Acute symptoms may arise, calling for interference. With regard to *chronic hydrocephalus,* diuretics are recommended, with the view of causing absorption of the fluid. Pressure around the head by a bandage or strapping, and removal of the fluid by a fine trocar, or the aspirateur, have also been employed.

4. *Of Spinal Diseases.*—*In acute inflammations* the patient should be kept at rest, lying on the side, or in a somewhat prone position. Ice may be applied constantly along the spine. In some cases application of leeches is useful. Medicines are of

doubtful value. Dr. Radcliffe recommends iodide of potassium with opium in meningitis. When the cord is involved, belladonna, conium, and ergot are believed to have a direct beneficial effect upon it. It is particularly important to attend to the bladder and bowels in cases of disease of the cord; to see that the patient is kept clean and dry; and to guard against bed-sores, for which object a water-bed is very valuable. This applies particularly to *chronic* affections, in which all that can be done further is to support the general health by food, proper hygienic conditions, and tonics, especially quinine, iron, and preparations of phosphorus; promote absorption of morbid products, particularly *syphilitic* by iodide of potassium and bichloride of mercury; stimulate the functions of the cord by minute doses of strychnia, and treat the paralysis. Cases of *locomotor ataxy* have been benefited by electricity and large doses of iodide of potassium, at the same time using measures for improving the general health.

CHAPTER LXVI.

In this chapter some of the rarer diseases of the nervous system will be briefly considered.

WASTING PALSY—PROGRESSIVE MUSCULAR ATROPHY.

For a full account of this subject, the reader is referred to Dr. W. Roberts's writings.

Etiology and Pathology.—This curious affection has been attributed pathologically to an atrophic and degenerative change beginning in the involved muscles themselves, in the anterior roots of the nerves supplying them, or in the spinal cord, but there is no certainty in the matter. The chief supposed *exciting causes* are exposure to cold and wet; a blow or fall on the neck or back; and excessive use with consequent fatigue of muscles. It occurs by far most commonly in males, and usually about thirty years of age. In some cases it appears to be hereditary, or to affect several members of the same family.

Anatomical Characters.—The affected muscles are wasted more or less, pale and yellowish, soft, the muscular fibres being replaced by a granular, fatty, gelatinous tissue. The muscles are altered to a very variable degree, and one may be found quite gone, while that next it is unchanged, or healthy bundles may be seen in the midst of the new material. The upper portions of the muscles are usually most changed. The anterior roots of some spinal nerves and the sympathetic branches joining them, have been found atrophied and the nerve-elements replaced by a finely granular tissue. Similar changes have also been noticed in the posterior columns of the cord and posterior cornua of the gray matter, with thickening and granular degeneration of the vessels, though the cord may appear healthy to the naked eye.

Symptoms.—Wasting palsy sets in very insidiously. It usually begins in one shoulder or hand, especially in the right deltoid, but gradually progresses from its starting-point, invading other muscles, until, finally, every muscle in the body may be involved except those of the eyeball, eyelids, and the muscles of mastication. There is loss of power proportionate in extent and degree to the wasting, and which may terminate in absolute helplessness with inability to swallow, speak, or breathe, death then occurring from asphyxia. At the same time there are marked objective signs of the atrophy of the muscles, which are well seen about the shoulders and in the hands, the latter assuming the "claw-hand" shape, in which there are deep depressions from the wasting of the muscles, while the tendons stand out, and the fingers are drawn in towards the palm and pushed back. The face assumes a vacant, idiotic expression when it becomes affected. During the progress of wasting, the muscles present constant flickering movements, so long as any muscular tissue is left, which are more marked if the skin is exposed to cold or blown upon. The irritability and force of contraction under electricity become diminished in proportion to the waste of tissue. The mind is unaffected to the last. Pain may or may not be complained of in the affected parts. There is never any loss of power over the bladder or rectum, and the heart is never implicated. In some cases the disease does not spread to the extent just described, but it stops in its progress, the patient recovering, especially when it is due to fatigue of special muscles.

Treatment.—The first necessity is to remove the cause, if possible, supposing it still in operation; if the disease has arisen from the overuse of certain muscles, these must be allowed to rest. Attention to the general health by warm, or sulphur baths, as recommended by some, is very important, together with change of air, and regular, slight exercise. *Cold baths should not be used.* More or less improvement can almost always be gained by *faradization* when perseveringly applied. According to Duchenne, "The more a muscle is atrophied and its contractility diminished, the longer it should be subjected to the stimulation, the more intense should be the current and the more rapid its intermissions. When the sensibility is seen to return, it is prudent to diminish the intermissions and abate the intensity of the current." Pain may be subdued by warm fomentations, or warm baths, or rest, or if it is severe by the hypodermic injection of morphia.

Writers' Cramp—Scriveners' Palsy.

Etiology and Pathology.—Dr. Vivian Poore has recently paid considerable attention to this curious form of nervous disorder, and has published his observations in a series of papers in "The Practitioner," which will well repay perusal. As its name indicates it is met with principally among those who write a great deal, but similar derangements are observed in connection with other occupations in which certain muscles are being constantly brought into play, as among violinists, pianoforte players, seamstresses, milkmaids It is unknown under thirty years of age; much more common in the male than in the female sex; it cannot be said to be due entirely to overwork of the muscles, or to worry of mind and anxiety, though it does occur most frequently in persons who habitually overwork certain muscles necessary for the complicated actions, and are the subjects of much mental trouble, which in most cases is much aggravated by the inability to follow the employment by which they have to gain a livelihood.

As regards the pathology of the disease, it has been attributed to loss of co-ordinating power over the muscles concerned in their complicated action owing to disease of the nerve-centres governing them; or to chronic fatigue and consequent spasm of the muscles involved; but it must be acknowledged that the pathology of the disease is very obscure.

Symptoms.—A man first feels his fingers a little achy after writing; he notices his handwriting looks unnatural, he has to hold his pen more tightly than before; after a time, if the action is persisted in, there is distinct cramp or tremor of the hand. The writer now adopts means to rest the muscles of his thumb and fingers, and he uses the muscles of the wrist and forearm, and these muscles soon take on the same spasmodic action. The patient may now learn to write with his left hand, when a similar affection is in a short time produced on that side. After long persistence of the cramp there is sometimes feebleness of the muscles, but this quasi-paralysis is rare. As a rule there is no paralysis in uncomplicated cases, and persons who are unable to write more than a sentence or two without their muscles refusing to continue the action, can immediately engage in any other of the complicated movements of the fingers and hand such as are required in violinists or pianoforte players. The general health in most cases is good, but there is soon more or less depression of spirits.

Diagnosis.—The diseases most likely to be mistaken for writers' cramp are *lead poisoning* and *wasting palsy*, but in both of these there is well-marked paralysis of muscles rather than cramp.

Prognosis.—If the condition has only existed for a very short time, a are may be expected, if the patient can give the muscles involved a long st from the particular employment which produced the cramp; but in ore chronic cases the prognosis is most unfavorable.

TREATMENT.—Absolute and prolonged rest from the particular work hich produced the cramp, and the constant current are the only two eans considered of any service in the treatment of writers' cramp. Dr. eynolds, however, says he has seen no good result follow the employ-ent of electricity. Niemeyer and Poore each record cases which have een relieved by the use of the constant current.

PARALYSIS AGITANS—SHAKING PALSY.

Under this name are included two very distinct diseases, the *senile form* nd the *non-senile form*.

1. *Paralysis agitans senilis* commences usually insidiously, is slow in s course, seldom occupying less than ten years, the symptoms increas-g in importance, generally ending fatally. It has been arbitrarily ivided into five stages: 1. *Commencement*, when limited to one part of e body, most frequently the hand or arm. 2. *Generalization of the emors*, when the legs are affected as well as the arms, the head and neck s well as the tongue partake in the tremors and movements, which have ow become more general; the muscles of the face, eyelids, and eyeballs re never affected. 3. *Disturbance of equilibrium*, or the running stage, hich is variable in its time of occurrence, sometimes appearing early, ometimes not till ten or twelve years. It is very characteristic of the isease, often indicated by the additional term "festinans;" the patient annot walk, he runs, looking as if he must fall down, but Dr. Reynolds as never known a man fall down in this way; his spine is bent forwards, wing to loss of power of the extensor muscles of the back. 4. *Disease fully stablished*, when there is distinct weakness in the muscles affected; the atient is unable to write, or perform any manipulations, such as are neces-ary for feeding, dressing, &c. 5. *Advanced stage*, when the tremors which ad previously been suspended at intervals during the day, prevent his leeping, or awaken him when asleep. The patient's state now becomes eplorable, there is inability to masticate or to swallow his food, power f speech lost, urine and fæces passed involuntarily, constant sleeplessness, nd death from exhaustion.

2. *Paralysis agitans non-senilis* occurs under fifty years of age without atal tendency, and sometimes admits of cure: there is no disturbed equilibrium; diminution of muscular power is slight; general health not im-aired; duration indefinite; the tremors can be distinctly controlled by olding the limb; and may be stopped by a constant current. *Hysterical aralysis agitans* belongs to this group, is accompanied by other charac-eristic signs of hysteria, and though often obstinate, is free from danger, nd may usually be cured by judicious treatment. Other forms may be

included, as, *intermittent paralysis agitans*, frequently depending on intestinal worms in children; *reflex paralysis agitans*, coming on from a wound; or *paralysis agitans toxica*, when it is due to various poisons, as alcohol, tobacco, tea, coffee, mercury, &c.

Etiology.—The senile form rarely comes on under sixty years of age, rarely in the female sex; in some it appears to be hereditary; in eight out of ten the cause has been some emotion, anxiety, or long-continued trouble. The cause of the hysterical reflex and toxic forms have already been indicated.

Diagnosis.—Paralysis agitans may be distinguished from other tremors by the fact that the movements occur not only during action, but also when the parts are not in use, and are supported. *Tremor senilis* may pass into paralysis agitans when the tremors which begin during action continue after it has ceased. In *chorea* the movements are jerking, irregular, changing frequently, the tremors in paralysis agitans consisting of to and fro oscillations, due to the alternate action of antagonistic muscles. The diagnosis of the different forms of paralysis agitans may be gathered from attention to the description and etiology of each form.

Pathology and Morbid Anatomy.—In many cases of idiopathic paralysis agitans no discoverable morbid condition has been found, but in the more inveterate cases, especially in the senile form, an atrophic condition of the spinal cord, pons, crura, or medulla oblongata has been found; with in addition in some autopsies of an indurated condition, with patches of gray gelatinous degeneration, due to new formation of connective tissue, which compresses or atrophies the proper nerve structures (Oppolzer).

Treatment.—In the non-senile forms the treatment must be directed to the cause, such as the removal of worms, abstention from the use of alcohol, mercury, &c. Tonic treatment is especially indicated, such as iron, arsenic, zinc; tepid baths and the use of the constant current have been proved beneficial. In some cases the affection is very obstinate, and in the senile form no cure must be expected, though occasionally arrest of the disease for a time may be obtained.

Essential Paralysis of Children—Infantile Paralysis.

Etiology and Pathology.—The symptoms of this disease are such as would arise from a *spinal congestion*, and in many post-mortem examinations no organic disease of the spine has been found; still, in some cases, wasting in the anterior and lateral columns, and anterior roots of the nerves, has been detected. The causes of the disease are very obscure; it occurs almost exclusively between the ages of six months and three years, *i. e.*, the period of primary dentition; *sex* has no influence, nor has the previous health of the patient, the disease coming on as frequently in the robust as in the strumous and cachectic. It comes on sometimes during the course, or as a sequela of the acute exanthemata.

Symptoms and Course.—In many instances the loss of power is ushered in by a slight febrile attack, lasting 48 hours, more or less, or by convulsions or delirium, or quite suddenly, without any premonitory symptoms, during the night or the day. The loss of power is complete, at first usually in one limb, leg, or arm, or both legs, rarely in the leg and arm of the same side; sensation not impaired, sometimes exaggerated; bladder and rectum not affected; parts affected relaxed, not rigid; no reflex movements; no progressive increase of paralysis; some of the muscles paralyzed soon recover their power, while others remain powerless. After the paralysis has existed some time, the affected muscles become atrophied, the temperature of the part falls, nutrition of the whole limb is affected, the bones do not grow, so that the paralyzed limb may be an inch or two shorter than the sound one; contractions and deformities may occur from excess of action of the healthy over the paralyzed muscles. The general health usually remains unimpaired.

Diagnosis.—There is nothing in the initial fever distinctive; but when the paralysis occurs it may be confounded with meningeal hemorrhage, but in this you have tetanic spasms and speedy death.

Prognosis.—The disease is scarcely ever fatal to life; occasionally perfect recovery occurs in a few days; it is generally, however, much less complete, and much longer in duration. If the fever is well marked, you get well-marked paralysis; the prognosis is bad when the wasting is great, when there is distinct loss of voluntary power, and of electric irritability; the prognosis is good, when you can exhibit some signs of electric contractility, even though there is loss of voluntary power and great wasting.

Treatment.—During the first few days of the attack the child should be kept in bed, on bland, unstimulating diet, and a warm bath night and morning. After the febrile condition has subsided, much benefit may be derived by frequently rubbing the affected limb with some stimulating liniment, and the use of the constant current to the paralyzed muscles. The child should be encouraged to exercise the affected muscles a little every day. As the muscles regain power, their susceptibility to the continuous current diminishes, and then much benefit will be gained by the use of a weak induced current. If the paralysis has been neglected for some years, the use of orthopædic apparatus may be necessary, continuing at the same time the use of electricity.

Epidemic Cerebro-Spinal Meningitis.

Cerebro-spinal fever, as this disease is named in the "Nomenclature of Diseases" of the College of Physicians, is there defined as "A malignant epidemic fever, attended by painful contractions of the muscles of the neck, and retraction of the head. In certain epidemics it is frequently accompanied by profuse purpuric eruption, and occasionally by secondary effusions into certain joints. Lesions of the brain and spinal cord and their membranes are found on dissection."

ETIOLOGY.—There is no satisfactory evidence of infection or contagion: it occurs principally in the winter months; in males more frequently than in females; it is a disease eminently of early life, the aged being rarely affected; there is no definite relation between the sanitary state of habitations and individuals and the occurrence of the disease; the better classes have been affected quite as much as the poorer; different epidemics have exhibited most varied conditions as regards the cause and the course of the malady.

SYMPTOMS—The symptoms and course of this disease may be fully explained by the changes in the meninges of the brain and spine. It commences generally with no prodromata; there is sudden shivering, with vomiting, and violent pain in the head, of varied seat, constant generally throughout the disease; pain in the back of the neck, and sometimes down the spine; the head is forcibly drawn back; violent pain in the stomach; cutaneous hyperæsthesia; pupils contracted; bowels constipated; pulse very weak, very varied in frequency; temperature not high, very varied in different epidemics, generally between 100° F. and 103° F.; evening exacerbation slight; by the third or fourth day of the disease tetanic contraction of the muscles of the neck and back become evident, occasionally there is trismus, excessive opisthotonos; delirium occurs; herpetic spots appear, chiefly about the lips and face, or in patches over the limbs or trunk; or purpuric spots may occur, scattered more or less thickly over the whole surface of the body; the patient passes into a deep coma, and death ensues. Death may occur on the first or second day, or may not take place till the sixth or seventh week. Epileptiform convulsions are very rare; paralysis rarely occurs; not infrequently amaurosis occurs from keratitis, or exudative choroiditis; deafness too is very frequent.

DIAGNOSIS.—The history of the development and progress of cerebrospinal fever, together with the absence of the characteristic rashes, will generally serve to distinguish it from *typhus*, or *typhoid fever*; *tetanus*, which it somewhat resembles, never manifests the early grave cerebral symptoms.

PROGNOSIS.—The mortality varies much in different epidemics; in some it has been as high as 80 per cent., in others not more than 20 or 30 per cent.; it is highest at the commencement of an epidemic; more fatal among infants and young children, and adults after the age of 30. Life is most in danger during the earlier days of the disease; convalescence is generally very protracted.

MORBID ANATOMY.—Dura mater of skull and spinal canal much increased in vascularity; large clots of blood in sinuses; purulent infiltration of pia mater: it may exist over front half of one or both sides; substance of brain showing signs of inflammatory change, almost always less resistant, even pulpy in the vicinity of the ventricles. Spleen and mesenteric glands and other organs healthy.

TREATMENT.—Attention to the hygienic arrangement of dwellings when an epidemic is threatened should be recommended, though we are at present ignorant of the actual cause of the spread of the disease. When the disease is established, there is no specific line of treatment to recommend, but good nourishing diet, stimulants in most cases, and opiates, would be likely to be of the most service.

GLOSSO-LARYNGEAL PARALYSIS.

This rare affection is a paralysis of the muscles of the tongue, soft palate, and orbicularis oris; the only constant *anatomical lesion* found post mortem has been extreme atrophy of the root, and sometimes of the trunk of the *hypoglossal nerve*, together with an increased hardness, sclerosis, of the medulla oblongata, the muscles of the tongue, and other muscles, being quite healthy.

SYMPTOMS AND COURSE.—The first circumstance which attracts a patient's attention is slight embarrassment of speech, owing to slight loss of power of his tongue; this continues; mastication becomes difficult; he cannot pronounce the vowels *o* and *u;* and there is occasional dribbling of saliva when the head is inclined. The patient may be able to swallow iquids; more solid food often regurgitates through the nostrils, or small portions pass into the larynx, and there is imminent danger of death by suffocation. Excessive weakness of respiratory muscles now becomes apparent, and the diaphragm itself acts feebly, and the auxiliary muscles of respiration come into play. If the patient now gets an attack of bronchitis, there is great danger of death from asphyxia. The patient may die from exhaustion from want of food, or more suddenly from asphyxia, from the impaction of food in the larynx. The disease is progressive, absolutely incurable; only gradually affects the general health.

DIAGNOSIS.—Double facial paralysis, diphtheritic paralysis, and progressive muscular atrophy, beginning in the tongue, would be diseases most likely to be confounded with glosso-laryngeal paralysis; but with a careful attention to the history, and noticing the extent and kind of paralysis present, no mistake could be made.

TREATMENT.—Hitherto no authentic case of improvement or cure has been reported; the only treatment which can be employed is the giving he patient plenty of nourishing food, frequently, and in the form in which he can swallow it; if necessary, he may be fed by nutrient enemata.

CHAPTER LXVII.

DISEASES OF THE SKIN.

THE term "skin disease" applies to every deviation from the normal condition of the structure and function of the skin and its appendages, the glands, hairs, and nails. In the following chapter, however, we shall not discuss the so-called surgical diseases of the skin, but confine our remarks to those affections which are likely to come under the care of the physician.

But in order to study diseases of the skin profitably, we must at the outset, adopt some method of classification, whereby we may arrange into groups and classes the various affections which bear some relation to one another. The best method, perhaps, would be an anatomico-pathological one, the different diseases being divided into two great classes, namely, those having a constitutional origin and those purely local. Unfortunately, this is, in the present state of our knowledge, impossible.

Many skin affections are clearly dependent on constitutional conditions and many are purely local, but there is an intermediate class which may be local or constitutional, or even partake of the characters of both. For instance, some diseases which are purely local may be aggravated or determined by constitutional conditions, while many affections, due really to some morbid condition of the general system, are determined by some cause acting locally. On the other hand, a strict anatomico-pathological classification would become too complicated by the never-ending extensions and modifications of morbid processes.

In this country, the system first proposed by Plenck, and subsequently adopted by Willan, is the one most commonly accepted; but although it possesses certain practical advantages, it is open to the serious objection of including in the same order diseases which, beyond possessing one insignificant common character, are widely different.

The classification of Dr. Tilbury Fox possesses all the advantages of the Willanean system, and is free from many of its faults, and we accept it therefore, as being the best adapted for clinical study and the most useful in assisting the student in preparing for his examinations. Diseases of the skin may therefore be classified as—

1. THE ERUPTIONS OF THE ACUTE SPECIFIC DISEASES.—These have already been fully described.

2. LOCAL INFLAMMATIONS, including: *a. Erythematous*, as erythema, roseola, and urticaria. *b. Catarrhal*, as eczema. *c. Bullous*, as herpes, pemphigus. *d. Suppurative*, as ecthyma, impetigo, impetigo contagiosa, and furunculus. *e. Plastic*, as lichen and prurigo. *f. Squamous*, as psoriasis, pityriasis simplex, and pityriasis rubra.

3. DIATHETIC affections, including strumous, syphilitic, and leprous.

4. HYPERTROPHIC AND ATROPHIC, under which may be classed xeroderma and ichthyosis, keloid, fibroma, scleroderma, as hypertrophies; and atrophy and senile decay, as atrophies.

5. NEW FORMATIONS, as lupus, rodent ulcer, and cancer.

6. HEMORRHAGES, as purpura.

7. NEUROSES, as hyperæsthesia, anæsthesia, and pruritus.

8. PIGMENTARY CHANGES.

9. PARASITIC DISEASES.—*a. Dermatozoic*, as scabies, phtheiriasis. *b. Dermatophytic*, as tinea favosa, tinea tonsurans, tinea kerion, tinea circinata, tinea sycosis, tinea versicolor, onychomycosis, and, according to some, tinea decalvans.

10. DISEASES OF GLANDS AND APPENDAGES.—*a. Sweat glands*, as miliaria, sudamina, and lichen tropicus, &c. *b. Sebaceous glands*, seborrhœa, acne, xanthelasma, molluscum contagiosum. *c. Hairs and their follicles. d. Nails.*

THE ERYTHEMATOUS INFLAMMATIONS.

Under this heading are included erythema, roseola, and urticaria, all of which are characterized by redness, due to hyperæmia of the capillaries of the papillary layer of the skin, and accompanied by the exudation of a certain amount of serum into this layer, and into the rete Malpighii. The exudation may be so small as to be entirely overlooked, or sufficient to cause swelling of the epidermic cells, as in wheals of urticaria, or even to form little vesicles, as in the vesicular variety of urticaria. The redness readily disappears on pressure, but returns immediately the pressure is removed. When the congestion resolves there is generally a certain amount of furfuraceous desquamation of the loosened cuticle. The exciting causes are local and constitutional. In the former the hyperæmia is almost the only thing present; but in the latter a certain amount of febrile reaction, which is sometimes very severe, usually precedes the appearance of the redness. The duration varies from a few hours to several days.

Erythema is characterized by the presence of slightly elevated, red patches of various sizes, the color of which shades off towards the edge. The redness disappears under pressure, but at once returns when the pressure is removed. There is generally heat, tingling, and itching, and sometimes severe pain, together with a certain amount of constitutional disturbance, but the actual course varies according as the disease is of local or constitutional origin. When the redness is due to friction of two folds of skin, or to the irritation produced between them by retained secretion, it is called *erythema intertrigo.* The redness that is sometimes seen on the hot, tense, fissured skin of anasarcous legs, and which sometimes leads to superficial ulceration, is named *erythema læve;* and the redness of an unbroken chilblain has received the dignified appellation *erythema pernio.*

But more important than these are the constitutional varieties. In *erythema papulatum seu tuberculatum* there are papulated, red patches and tumefactions on various parts of the body, but more particularly on the dorsal aspects of the hands, arms, feet, and legs, generally attended with a disagreeable burning sensation, and a certain degree of fever. The patches gradually disappear in a few days, but in some rare instances the disease becomes chronic. Several minor varieties have been named after the accidental shapes that the patches sometimes assume, as *erythema iris, circinatum gyratum;* while the term *erythema fugax* is given to the transient red patches that sometimes show themselves on the neck and face after errors of diet, &c. The most important variety, however, is that called *erythema nodosum*, which consists of oval or circular, slightly elevated, red patches, from a quarter of an inch to an inch and a half in diameter, which occur on the front of the legs parallel to the tibia, the swelling and redness gradually shading off into the surrounding tissues. In a day or two the swellings assume a purplish tinge, and soften in the centre, but never suppurate, and finally disappear with desquamation of the cuticle. The disease is, however, liable to recur, especially if the health remain bad. Sometimes the patches show themselves on the upper limbs also. The disease is met with for the most part in young children, especially girls or in delicate adults, is generally preceded by some febrile disturbance, and has frequently been observed to be associated with acute rheumatism.

Roseola is a non-contagious, febrile disease, accompanied by the eruption on the skin of minute, rose-colored, non-crescentic spots, which are generally attended with considerable itching and tingling. There is not necessarily any catarrh, and the eruption is very irregular in its situation and extent. The disease is frequently seen in infants, hence the term *Roseola infantilis,* and the variety which occurs from the heat of the sun in summer is called *roseola æstiva.* The redness, which is preceded by some constitutional disturbance, lasts from a few hours to several days. A roseolous rash sometimes precedes the outbreak of a variolous eruption. Sometimes it occurs four or five days after vaccination. It is often seen also in gouty or rheumatic persons, and may occur in cholera. All these varieties have been dignified with special names. Certain medicines, as belladonna and copaiba, may produce a roseolous rash on the body, which rapidly disappears on the discontinuance of the drug.

Urticaria is due to the rapid serous infiltration of the cells of the lower layer of the epidermis, which results in the formation of a slightly elevated, pale patch known as a "wheal." That this is the true cause may be proved by puncturing the elevation and letting out the transparent clear fluid, and by the fact that the exudation is sometimes sufficient to raise the cuticle and produce a vesicle, as in *urticaria vesiculosa.* The disease may be acute or chronic, and due to local or constitutional causes, or to certain poisons in the blood. There is therefore, *urticaria from external irritants,* as the bites of insects and the stings of nettles; *urticaria ab ingestis,* as shell-fish, certain kinds of fruit, and some drugs, as belladonna and copaiba; *urticaria febrilis,* in which there is some pyrexia; *chronic urticaria* and *urticaria* due to *uterine disturbances.* There is, lastly, another variety, which is seen in children, in whom from gastro-intestinal disturbance, or from mere local irritation, an urticaria is developed which leaves behind a crop of papules due to the engorgement of the follicles of the skin. This has been called *urticaria papulosa*, or *lichen urticatus.*

There is always a considerable amount of itching and tingling, which may last a few minutes or for many days. The constitutional symptoms are not usually severe, but sometimes there is high fever, vomiting, dry tongue, and even delirium. The wheals are very transient, and do not usually last more than an hour or two, but sometimes they last many hours and even days. The paleness of wheals is owing to the pressure which the exuded serum exerts on the papillæ.

TREATMENT.—It will be seen that constitutional and local remedies will be necessary in the majority of the cases, but in all the cause must be removed. Locally, soothing applications are best, as the various preparations of zinc, calamine, lead, &c. Excoriated surfaces must be protected, and where the skin is chafed by the friction of two folds of skin, the parts must be kept dry, and separated by folds of lint on which some absorbent and soothing powder has been sprinkled. All local irritants must be removed. Constitutionally, an occasional mild purge and light diet for a day or two is all that will be necessary in most cases. Whenever the disease is due to poisonous food, the stomach must be at once evacuated. In erythema nodosum, however, quinine alone or combined with some preparation of iron, will be found very useful in preventing the recurrences.

CATARRHAL INFLAMMATION.

Eczema is a catarrhal inflammation of the skin, and consists of an exudation into the papillary layer of the cutis, and into the rete Malpighii, giving rise to papules or closely-packed vesicles or pustules, which in time run together, burst and expose an excoriated surface which discharges a fluid which dries into yellowish crusts. There is generally considerable heat and swelling of the part before the discharging stage is reached. Fresh crops of vesicles come out from time to time. The causes of eczema are constitutional and local, among the former of which may be mentioned dyspepsia, sluggish action of the liver or kidneys, and gout. Anything which will irritate the skin locally may produce an eczema; the disease is also very apt to occur on the congested skin of legs in which the veins are enlarged and varicose.

When the disease has lasted some time, the skin becomes thickened, infiltrated, and fissured.

In the simplest form it is called *eczema simplex*, but when there is much inflammation and great redness, with heat, swelling, and perhaps also pyrexia, it has been named *eczema rubrum*. Other varieties have been named according to the seat of the disease, whether on the scalp, ear, face, hands, nipple, &c.; but the disease is essentially the same in every case. It may, however, be remarked that when there is much pus formation, or when the disease commences with pustules, it is called *eczema impetiginosum*, or *impetigo*. The term *eczema marginatum* has been given by Hebra to a variety which commences on the inner part of the thigh against which the scrotum lies, by a small and circular excoriated patch which spreads upwards to the abdomen but leaves the penis untouched. Eventually, the disease may reach the upper part of the chest by extending at the periphery while the centre clears. It is most commonly seen among shoemakers and horse-soldiers. By some it is regarded as being syphilitic, and by others as parasitic, the latter view being probably correct in the majority of cases. There is, lastly, a variety of chronic eczema which is more frequent than is commonly imagined. The disease is characterized by circular patches, especially on the back of the hand and on the forearm. There is not much discharge and only little crusting, but the itching is severe. On examining microscopically the crusts of several of these cases, the writer often found some of the trichophyton fungus, and it would seem that these cases are really inflamed patches of tinea circinata. Certain it is, they readily recover under parasiticide treatment. This variety may, therefore, be *eczema parasiticum*.

TREATMENT.—The treatment of eczema must vary so much in every particular case that it would be irrational to lay down a

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BULLOUS INFLA

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appear on persons previously quite healthy. The variety known as *herpes zoster* or *shingles* is most probably due to disease of the trophic fibres of the spinal nerves.

Several varieties have been named according to their seat, as *herpes facialis, labialis, preputialis,* while the term *herpes zoster,* or *zona,* is given to the variety which occurs on the trunk. But all these varieties are essentially the same disease.

The disease usually commences with a burning pain, which is sometimes severe. In a few hours red points appear along the course of a particular nerve, and within twenty-four hours a crop of clear watery vesicles or small bullæ are seen on the reddened base. Now the pain usually subsides. The contents of the vesicles become turbid, and in a few days dry up into brownish scabs, which fall off in about ten days, leaving little cicatrices which may remain permanent. The eruption is usually entirely confined to one nerve, and rarely transgresses the mesial line of the body, and still more rarely is it found symmetrical. Occasionally, distressing constitutional symptoms precede the appearance of the vesicles, and in some of the cases where the eruption appears on the face, the severity of the preceding symptoms has led to the diagnosis of serious affection of the brain. But all these symptoms subside on the appearance of the vesicles. In some cases where the eruption has followed the course of the ophthalmic division of the fifth nerve, serious and even destructive inflammation of the eyeball has been observed.

It frequently happens, especially in the form that occurs on the prepuce or dorsum of the penis, that the disease recurs with a degree of periodicity, the intervals varying from a month to a year or more.

The affection most commonly known as *herpes circinatus* is probably always of parasitic origin, and is not, therefore, a true herpetic eruption.

Treatment.—As the disease is self-limited, the duty of the practitioner is clear. He must not hope to hasten or retard its progress. If the parts be protected by cotton-wool and some cooling powder, as starch, all that is necessary will have been accomplished. Subsequently, quinine may be found of great benefit, and should the pain recur or never entirely subside, the application of a belladonna plaster or inunction with belladonna ointment will be found useful.

Pemphigus.—Here we have large isolated bullæ, filled with clear fluid upon a slightly reddened but not hardened base. The lesion, in fact, resembles an ordinary blister. The cause is very obscure. It occurs in newly born children as the result of syphilis, and is then nearly always fatal. It is more common in children than adults, although the writer has lately seen a well-marked case in an old man over sixty years of age. Generally, the eruption is preceded by ill-health, but sometimes the patient is quite healthy.

The disease commences as a red discoloration, which itches and burns. Upon this a bulla forms, which may from the first acquire its full size, or commence as a vesicle which increases in size. At first the bulla is round or oval, with clear contents, and varies in size from that of a pea to that of a hen's egg. In a day or two the contents, as well as the cuticle, become opaque. In cachectic persons the contents often become mixed with blood. In two or three days the bleb bursts, and leaves a moist discharging excoriation, which in time becomes covered with a scab, under which new epidermis forms. For a long time after a pigment stain, but not a cicatrix, marks the site of the old bulla. Before one set of bullæ has disappeared new crops spring up, which are themselves succeeded by others, and so the disease goes on for weeks or even months. Sometimes only one bulla is present at a time, as in *pemphigus solitarius.* The extremities are the most common seats of the eruption, but it may occur on any part of the trunk.

If the disease be unchecked, the patient loses health and strength, and may ultimately die of marasmus.

In the variety of the disease known as *pemphigus foliaceous*, the disease begins as a solitary bulla, or by several which unite and spread, until in the course of months they have increased to such an extent that the entire skin looks flayed. This disease is very rare in England, and is always fatal.

TREATMENT.—The treatment of pemphigus resolves itself into giving tonics and good food. Locally, little can be done; but it has been recommended to puncture the bulla and pencil the tender cutis with a solution of nitrate of silver, ten grains to the ounce, which hardens the cuticle and destroys the great sensibility of the exposed cutis.

SUPPURATIVE INFLAMMATIONS.

By this is meant diseases in which the inflammation goes on to visible pus formation as a primary phenomenon. We have already een that in eczema the exuded fluid may give rise to a vesicle which may burst, or which may become a pustule by the accunulation of pus-cells within it. And, accepting the modern views of pyogeny, there is little difficulty in understanding that all the o-called serous inflammations may become suppurative, that, in act, all inflammations are attended with a certain degree of pus ormation. Although, therefore, impetigo, and impetigo contagiosa, and ecthyma have been classed as suppurative diseases, only the latter can strictly be so called, for the first is only a phase of eczema, and the second is really a vesicular disease, which may be accompanied by slight suppuration.

One of the affections most commonly known as impetigo is a disease of the hair-follicles, and ought to be so described, whereas he disease generally called impetigo is really the impetigo conagiosa of Dr. Tilbury Fox, which we shall now describe.

Impetigo Contagiosa.—If some of the clear fluid from one of the vesicles of this disease be inoculated into a healthy subject, we hall find that the point of inoculation remains red, and that in wenty-four to thirty-six hours a minute vesicle forms preceded and accompanied by severe and almost intolerable itching. If he cuticle be not ruptured the vesicles increase in size and the contents become sero-purulent, and in two or three days dry up nto flat, straw-colored scabs, under which new epidermis forms and the disease gets well. But as seen in patients the disease is omewhat different, for it is usually preceded by a little constitutional disturbance, and the vesicles which generally first form on he face may extend to the trunk, but nearly always remain isoated. The fingers will become inoculated by scratching, and in turn convey the poison to other parts of the body. Sometimes the disease appears to be epidemic, and will affect the whole body ike one of the acute specific diseases, with the exception that it usually takes a week or more for the body to become so extensively involved. It is most commoı frequently affects adults. The natu although some observers have supp they have discovered in the scabs, l that fungus, which is met with in th seen in the clear fluid when it is mo agent of contagion.

TREATMENT.—The scabs must b hair being cut short if necessary, a five grains of ammoniated mercury t the raw surfaces. This will serve days.

Ecthyma.—In this disease the pı vated, reddened, and indurated bı affects the tissue of the true skin, l If the true skin be affected and ul will result, but usually only a red ı clears off.

An ecthymatous eruption may be cation of tartar emetic ointment. 1 duced by anything that will irri cachectic subjects, and it is a comm children. It is sometimes seen duı eases, and may occur without any persons.

The inflammation which precedes is sometimes attended by constituti and a good deal of shooting pain. isolated and surrounded by the brc most commonly on the extremities on the trunk. The pustules are laı pea, or even much larger, and their with blood. In a few days the coı scabs, which fall off in a few day covered with new epidermis. Som continues beneath the crust, and which has taken place in the upper l catrix results. There are two chief varieties—the acute and ronic. The former is accompanied by severe constitutional mptoms.

Treatment.—Remove local causes, as pediculi, scabies, &c.; ply astringents, and give tonics and good food.

The Plastic or Papular Inflammations.

In the diseases included under this heading the inflammation accompanied by the formation of new tissue which forms little pules. The diseases comprised in this class are *lichen and* *urigo.* The diseases are constitutional in their origin, and re-ire general treatment. They are usually chronic and are very pt to recur.

Lichen.—In this disease there is an inflammation of the skin, which the exudation and the new tissue form little solid evations called *papules.* There is also some slight exudation to the rete Malpighii of the epidermis, which produces fine esquamation when the disease resolves. The exciting causes are ry obscure. The disease is frequently seen in strumous per-ns, but generally the subjects are quite healthy.

Lichen simplex is characterized by little papules of a pale d color, which do not disappear, but become paler on pressure. he skin generally feels dry and thickened. There is usually me itching and tingling, but sometimes there is no annoyance hatever. The most common seats are the back of the hands nd forearm, the neck, and the thigh. The papules disappear in week or two, and the disease terminates by desquamation of the ticle. Sometimes, however, the disease becomes chronic, and ay last for weeks or months. The disease may occur in circular atches, which fade away while fresh papules form at the margin, iving rise to the appearance known as *lichen circumscriptus,* and hen several of these patches unite it is called *lichen gyratus.* *ichen lividus* is really purpura, and *lichen urticatus* has already een described as a form of urticaria. In *lichen agrius* the ap-earance of the papules is accompanied by severe inflammation nd an almost intolerable itching and burning. The patches are ratched, and become excoriated and pour out a serous exudation, which makes the disease resemble eczema. In *lichen pilaris* the papule is seated at a hair-follicle, and the disease is characterized by the passage of a hair through the centre of the papule.

Hebra has described a variety of lichen, which he has named *lichen rubra*, and which seems to be an aggravated form of the *lichen planus* of Mr. Erasmus Wilson. In this disease there is an enlargement of the root-sheath at the lower part of the hair-follicle, which becomes expanded into little finger-like projections. The upper part of the sheath is also greatly hypertrophied, and presents an infundibular appearance with the base upwards. The disease shows itself externally as little papules with flat tops, and which become collected into groups by the development of fresh papules, and not by an increase in size of the old ones. The disease spreads till it affects a whole region or even the entire body. The appearance is then quite characteristic. The integument is greatly thickened, reddened, and covered with fine silvery scales, which do not, however, simulate the scales seen in psoriasis. The affection is very chronic and apt to recur. Often the patient's health is seriously deteriorated, and in some instances the disease ends fatally.

Treatment.—In the acute stages soothing applications must be used, and the general health must be treated according to the indications present in any individual case. Should the disease become chronic some stimulating applications will be necessary, as carbolic acid, tar, or some of the mercurial preparations. Internally, tonics or alteratives combined with some preparation of arsenic will be called for.

Prurigo.—The papules met with in this disease are due to serous exudation into the papillæ, and into the rete Malpighii, for if the papule be punctured a drop of clear fluid escapes, or if it is squeezed the epidermis becomes tense and transparent, and a watery liquid appears. The cause is not known, but the disease is rare in childhood, and is more common in men than women. The disease called *Prurigo senilis*, which is really only the congestion of the follicles of the skin produced by the irritation of scratching and of pediculi, is not a true prurigo, and will, therefore, be considered when we speak of phtheiriasis or lousiness. On the other hand, it must not be forgotten that the presence of any local irritant will aggravate true prurigo.

The disease is characterized by the presence of slightly elevated,)ad papulæ which are of the color of the skin. Many of the pules cannot be seen, but are readily felt by passing the finger er the skin. There is always severe itching, which is made rse by anything which irritates the skin. By scratching to ay the itching, the tops of the papules are torn off and finally come covered with a little blood-crust. Sometimes there is a isation of formication, hence the name *prurigo formicans.* When disease is mild it is called *prurigo mitis,* and when severe *rrigo ferox,* which is said by Hebra to be incurable.

The most common seats are the shoulders, neck, and the outer ects of the arms and legs and the buttocks.

TREATMENT.—Avoid everything that is likely to aggravate the nptoms. Apply soothing applications, anodynes, and sedatives. e itching may often be allayed by an alkaline lotion contain- hydrocyanic acid, or in some cases a solution of carbolic acid to 20 or 1 to 40) will allay it.

Tonics, cod-liver oil, quinine, and iron will be required in the er stages. A few cases, moreover, will be benefited by a course arsenic.

SQUAMOUS INFLAMMATIONS.

In the diseases which belong to this class the inflammation is companied by increased formation of epidermis. Although we lude under this head pityriasis rubra and psoriasis, the two eases are very different. For in the former there is a desqua- tion of the cuticle over the whole body, and in the latter an reased formation in certain regions as a result of the enlarge- nt and increased vascularity of the hypertrophied papillary rer of the cutis. The former, moreover, is a general disease companied by constitutional symptoms, and which may ulti- tely end fatally, whereas the latter is rarely attended with any nptoms referable to the general system. Both are, however, ble to recur.

Psoriasis.—The epidermal formation is considerably increased a result of enlargement of the papillæ and their capillaries. e collections of epidermis vary much in size, from a minute int to extensive areas occupying many inches of surface. The most favorite seats are the elbows and knees, from which the disease gradually spreads, but for the most part on the extensor aspect of the limbs. Next in frequency is the scalp and face, and more rarely the nails. The disease is often hereditary, but may occur in healthy persons who may have become temporarily debilitated.

It is characterized by the appearance of dusky-red or coppery, slightly elevated patches, covered with white silvery scales. At first the spots are minute, as in *psoriasis punctata*. When the spots increase in size, it is called *guttata*, when they are still larger, *nummularis*, when very extensive, *inveterata*, and when it consists of rings, *psoriasis circinata* or *Lepra*, which is, therefore, merely the healing stage of psoriasis, and from which it does not differ in any respect. When adjoining rings coalesce, the disease ceases to extend in that direction, and from the odd figures sometimes thus produced, the disease has been called *psoriasis gyrata*.

TREATMENT.—In the early and congestive stage, emollient applications are best, but later on, tarry preparations are very useful. Internally, great benefit will be derived from the use of alkaline diuretics, or tonics given at discretion. Arsenic is useful in a large number of cases, but it must be persisted in for months. Phosphorus is useful in some cases.

Pityriasis simplex consists of a slight superficial imflammation of the skin, followed by a furfuraceous desquamation. The scalp is the most common seat. This is altogether different from the disease which Hebra has described as pityriasis rubra, which although not common in England, is sufficiently important to merit some consideration.

TREATMENT.—Oily and astringent applications.

Pityriasis rubra of Hebra is a general superficial inflammation of the skin, which may begin in any part, but *which extends over the whole body within a couple of weeks.* The cutis is intensely congested, and the epidermis, which is greatly increased in quantity, flakes off in large masses. The desquamated cuticle is mixed with a small amount of exudation-matter, which is, however, never sufficient to cause more than mere moisture. The disease occurs in debilitated persons, and is very liable to recur, and is, in fact, said by Hebra to be ultimately fatal. When the case is

gressing towards a cure, the cutis becomes less red, the desqua-
tion ceases, and finally the skin resumes its normal appearance.
metimes, however, the disease becomes chronic.
REATMENT.—The patient must be rubbed with oil and wrapped
in bandages soaked in oil to remove the scales and to keep the
n soft and supple. Internally, tonics and cod-liver oil are
essary. Arsenic is not good, in fact, a man came into Univer-
y College Hospital, about a year ago, in whom an attack of
yriasis rubra came on while he was under the influence of arse-
for some small patches of psoriasis.

DIATHETIC DISEASES.

By this we understand diseases that are dependent on certain
rsistent morbid dispositions of the body which modify to a
ater or less extent all the nutritive processes. For the present
shall describe very briefly only the syphilitic eruptions.
Syphilitic eruptions will vary according as the patient is the
ject of hereditary or acquired syphilis.
Hereditary Syphilis.—The eruptions in this variety usually
w themselves when the child is a month or six weeks old, but
y be deferred for several months. In addition to the general
nptoms of hereditary syphilis, the child becomes affected with
cous tubercles and condylomata, and erythematous rashes,
ich may or may not become tubercular, appear about the palms
d the soles, but especially on the buttocks. Sometimes bullæ
d pustules accompanied by deep ulceration are present. But
en in boys and girls and young adults, papular, pustular, and
mmatous eruptions may show themselves as a result of heredi-
ry syphilis.
Acquired Syphilis.—The actual nature of the eruption will vary
cording to the stage of the disease. The first cutaneous phe-
menon after the initial stage is a *roseola*, which occurs chiefly
the trunk, and consists of coppery, non-elevated spots which
ave behind a dark stain or *macula*, which may last for weeks.
ext comes the *papular syphilide*, in which there is a deposit of
anulation-tissue. If the patches are still larger they are called
bercular syphilides, which frequently assume a circular, serpigi-

nous, or crescentic form. *Vesicular syphilides* are rare, but are sometimes seen. *Rupia* is a bullous disease, and is always syphilitic. The bullæ form like those of pemphigus, but instead of the crusts falling off they remain attached, while the ulceration extends under them and forms another crust. This goes on till several layers are formed, each one being larger than that above, hence the cockle-shell shaped crusts which are so characteristic of this disease. If the scab be removed, a gray, sloughy-looking ulcer will be exposed. The so-called *pustular syphilides* are usually due to the suppuration which takes place around the syphilitic deposit in the walls of the follicles in the disease known as *syphilitic acne.* The *squamous syphilides*, which have been called syphilitic psoriasis, differ from the true psoriasis, inasmuch as the scaling in syphilis is the result of a deposit in the true skin which disturbs the epidermic formation, and which, therefore, is really desquamation. It will be found, moreover, that the squamous syphilides rarely affect the seat of ordinary psoriasis. A squamous syphilide is very common on the palms and the soles, the desquamation always being preceded by a deposit of syphilitic tissue. In the latter stages of syphilis, true *gummata* are developed in and beneath the skin. These give rise to large, prominent, coppery, tubercular masses, which readily break down and ulcerate. It will, however, generally be found that the amount of true skin destroyed by this ulceration is much less than would be anticipated, the ulceration really resulting from a destruction of the gummatous matter, and the true tissue being removed rather by the pressure exerted by this deposit than by actual ulceration. None of the syphilitic skin eruptions are attended with itching when fully developed, but it is not uncommon to find severe itching when the eruption is first appearing. All the eruptions are, moreover, followed by deep, dusky-red staining, which may remain for months or even years after all sign of deposit has disappeared. By observing the general characters of the eruption and examining for a history of syphilitic inoculation, there will be no difficulty in establishing a diagnosis.

TREATMENT.—The treatment of syphilitic skin eruptions must be the general treatment of syphilis. Mercury, combined or not with iodide of potassium and alternated with tonics, must be iven in the earlier stages, and iodide of potassium, alone or ombined with quinine and iron, in the latter stages. It is very mportant in treating syphilis to combine tonics, which will often lone serve to dispel an eruption, or will at least greatly faciliate the action of the proper syphilitic remedies. Locally, merurial vapors or inunctions will be found of great service. The oughy-looking ulcers are best treated with the iodide of starch aste, which cleanses the sores and facilitates the reparative ction.

HYPERTROPHIES AND ATROPHIES.

In this class we include those diseases which are characterized y an increase or diminution of the normal elements of the skin. his class is therefore a large one, but we shall confine our remarks to ichthyosis and its modified form xeroderma, keloid, and ibroma.

Ichthyosis and Xeroderma.—In these diseases the papillary ayer of the skin and the epidermis are greatly hypertrophied. When there is a large accumulation of epidermis it is called *chthyosis*, but when the skin is merely roughened without any marked collection of the epidermis it is called *xeroderma.*

The disease is characterized by the dry, roughened condition of the skin of the whole body, which is congenital, and lasts throughout life. The patient is subject to eczematous eruptions n the flexures. When the skin is well protected and the weather mild, there is very little annoyance, but if the skin be irritated, as in windy, damp weather, it cracks and desquamates, and becomes very tender.

TREATMENT.—Although the disease is, strictly speaking, incurable, much may be done to relieve the patient's distress by oiling the skin and keeping it supple. No internal remedies are of any avail.

Keloid consists of a localized hypertrophied state of the fibrous tissue of the skin. The disease is *idiopathic* or *traumatic.* The *idiopathic* variety commences as a little elevated mass, which is at first pale, but soon becomes pinkish and shining, and sends out offshoots like claws, which contract and produce great deformity. The most common seat is the sternum. The *traumatic* variety

results from an enormous hypertro
closing a wound. It may therefore
been wounded, nor need the injury
pearance it presents is that of a slig
tubercle, with or without processes,
ing tissue.

TREATMENT.—Very little can be
been cured by pressure. Caustics an

Fibroma consists of sessile or ped
circumscribed hypertrophy of all the
are of the color of the true skin, and
When taken between the fingers the
feel, allowing of the inner surfaces o
one another. They may occur on
the palms and the soles, and may exis
not cause any pain except when they
or inflamed.

TREATMENT.—Nothing short of s
avail.

NEW FORMA

Under this heading are included th
of the skin, which are cancer, lupu
diseases are all chronic, and the ne
stant tendency to spread, ulcerate,
life. As cancer and rodent ulcer are
that is, require surgical aid, we shal
which may at any time come under t

Lupus.—This depends upon a nod
what Virchow has called "granulati
sisting of cells like those of the M
The shape, size, and extent of the gro
expressive of varieties, but in all case
the same. If the neoplasm does no
non-exedens, but if ulceration occu
another variety which has been ca
which the disease begins in the se
extends superficially at the periphery

he patches are studded with white or greenish points of sebum, hich project from the diseased follicles. When the disease sub- des, it leaves a thin shining cicatrix.

Lupus is rare before the tenth and after the thirtieth year, but often seen in scrofulous persons. The favorite seat is the face, specially the nose and cheeks, but it may occur on any part of he body. The disease commences as small, softish, red, and ascular nodules, which are not at all painful. In time the odules increase in size and extent, and become covered with hite scales of detached epidermis. After remaining for a vary- ng period of time, the growth may undergo fatty degeneration, nd become absorbed, leaving a superficial or depressed scar, ac- ording to the degree of deposit, *lupus non-exedens;* or the growth ay spread and become extensively and deeply ulcerative, pro- lucing unsightly deformities, and even destroying whole organs, *upus exedens.*

Treatment.—General tonics and good living; cod-liver oil is ery valuable in these cases, and often serves for a cure without ny local applications. Locally, if the parts be irritated and nflamed, soothing applications, as liquor plumbi, must be used. ater on, the growth may be destroyed by caustics, as acid itrate of mercury, arsenical paste, &c. Mercury plaster is often f great service in assisting to remove the growth.

Pigmentary Changes.

We shall describe but briefly the various pigmentary changes f the skin. They are simple and not attended with pain or dis- omfort beyond the annoyance they sometimes give to the tender eelings of ladies. All these affections are dependent on an in- crease in the quantity of the pigment of the skin. Sometimes the coloration is congenital, as in moles, but it is far more frequently acquired from irritation of the skin, or exposure to heat and sun. There are also what may be called pathological and physiological pigmentations of the skin, the former being seen in Addison's disease and certain cachexiæ, and the latter in pregnancy or even in women suffering from uterine affections. This *chloasma uterinum* is very common in the face of women, and rarely entirely disappears, although it becomes much fainter when gestation is over.

Treatment.—To remove the causes will often serve to cure the disease.

Parasitic Diseases.

This class includes all the effects produced by the various animal and vegetable parasites that may inhabit the human skin. We shall, therefore, have to describe first the *dermatozoic* affections, and secondly the *dermatophytic*.

The *Dermatozoic.*—In these diseases some animal parasite inhabits the skin and lives thereon. In describing the effects produced, it is well to distinguish between the *essential* and *the accidental* features of the disease. For instance, scabies is described as being a disease in which papules, vesicles, and pustules occur in certain situations, whereas the essential feature of the disease is the presence of the acarus in its furrow.

Scabies, as we have just said, is a disease due to the presence of the *acarus scabiei* in the epidermis. The female insect bores obliquely through the upper layers of the epidermis and deposits her eggs. She then tunnels her way under the epidermis, forming fine semicircular furrows or cuniculi, which she fills with eggs; for the male, which is distinguished from the female by being smaller and possessing suckers on the posterior parts of the hind legs, does not make these little furrows. At the point where the insect entered is a little vesicle from which the cuniculus extends. As a result of scratching and irritation, papules, vesicles, and pustules form, and the skin becomes excoriated and disfigured with large ecthymatous pustules. There is considerable itching, which is worse when the patient is warm, as in bed. The disease is most commonly seen between the fingers and toes, and extends up the limbs, but chiefly on the flexor aspects. It occurs, also, on the penis, and even on the face. In babies, it is most common on the buttocks, the acarus being transferred to the part from the hands of the nurse.

Treatment.—Sulphur-baths or sulphur inunctions, care being taken not to keep up the treatment too long lest eczema be produced.

Phthiriasis is the condition characterized by the presence of pediculi on the body. At least three kinds of pediculi infest the human body, the *pediculus capitis*, the *pediculus corporis*, and the *pediculus pubis*, or crab louse. It is not necessary to describe these well-known varieties, but merely to mention their effects.

The *pediculus capitis* inhabits the hairy scalp, and by the irritation it produces may give rise to impetigo with consequent enlargement of the glands in the neck. The *pediculus corporis* invests the trunk and clothes of persons, especially of those somewhat advanced in years. The characteristic lesion is a small depressed hemorrhagic spot, which is, however, *not* on the surface of the skin but in the mouth of the follicle. This is produced when the pediculus draws its proboscis out of the follicle from which it has been sucking blood, by a small quantity of blood escaping into the follicle. As a secondary result of the irritation and scratching the follicles of the skin become much congested and swollen, little papulæ form and the skin becomes more or less deeply pigmented; hence the disease known as *prurigo senilis*. The *pediculus pubis* is mostly formed in the hair about the pubes, but may be found in other parts of the trunk, and even on the limbs and eyebrows, but not, as far as is known, on the head.

TREATMENT.—Mercurial lotions or ointments applied to the skin. A valuable application consists of two grains of perchloride of mercury to an ounce of dilute acetic acid, which not only destroys the pediculi but dissolves the *nits* which are formed on the hairs. The clothes must be disinfected or the disease may recur.

The *dermatophytic* diseases are those characterized by the presence of vegetable fungi in or on the epidermis. They are *Tinea tonsurans*, *Tinea circinata*, *Tinea sycosis*, *Tinea kerion*, *Tinea versicolor*, *Tinea favosa*, and, according to some authorities, *Tinea decalvans*.

Tinea tonsurans is due to the growth upon the skin of the vegetable fungus called the *tricophyton*, which consists of oval transparent spores, many of which are isolated, while others unite and constitute jointed filaments. The fungus inhabits the hairs and their sheath, and the epidermis of the scalp and other parts of the body. When the hairs are affected they swell up, become paler in color, and lose their elasticity and break off at about two lines from the surface of the skin. The hair splits up and the cylinder is found full of sp effects of the fungus vary according either beard or scalp.

1st. *Tinea circinata*, or ringworm on little circular, pale, elevated spot of the which is covered with fine scales, and As the spot increases in size the centr becomes a ring, which may extend till of three or four or more inches. It the body, but is more common in th freely exposed to the contact of the hands, &c.

2d. *Tinea sycosis*, or ringworm of *circinata*, but soon the fungus invad follicles. The hairs break off short, while the adjacent tissue becomes sw disease is very rare in England, ve having been recorded.

3d. *Tinea tonsurans*, or ringworm chiefly in children. The disease begins varying size, from which the hairs bre by the furfuraceous scaliness. The pat short stumps of pale hairs, which are

If by any means the patch of ringw tissue surrounding the hair becomes hairs fall out and the follicles pour o is what has been called *Tinea kerion.*

4th. *Tinea versicolor*, or *chloasma*, a the peculiar fawn-colored furfuraceous is due to the presence of the fungus *furfur*, which consists of fine curved br collections of granules.

The favorite seat of the fungus is th may extend to other parts of the body in phthisical persons, and is undoubte

5th. *Tinea favosa* is seldom seen in I in young ill-nourished children. This the presence of yellow cup-shaped cru r united into large masses. The fungus of which the scabs are omposed is the *Achorion Schönleinii.* The disease begins in the nner root-sheath of the hair-follicle, from which it spreads, and s usually accompanied by deep ulceration of the skin. Under he microscope the fungus consists, for the most part, of little ounded or oval bodies of about $\frac{1}{3000}$th of an inch in diameter.

The crusts possess a peculiar odor, which has been compared o the smell of the urine of a cat, or of a cage in which mice ave been kept. Although the hairy scalp is the most frequent eat of the disease, it may occur on other parts of the body, as he face, arm, and neck.

6th. *Tinea decalvans.*—The disease commonly known by this name, but more correctly called *Alopecia areata,* has for long been regarded as a parasitic disease, due to the *Microsporon Audouini,* but the evidence of its parasitic nature is entirely wanting, many good observers having failed to find any plant. The disease consists of smooth, shining bald patches on the scalp. The roots are atrophied, and the hair readily falls out. It appears to be due to a malnutrition of the hair of certain parts. Generally the hairs grow again. Numerous cases have been recorded to show the contagious nature of this disease, but few have ever attempted to show the fungus, and it is certain that in the majority of the cases designated tinea decalvans, no fungus can be seen. It is possible, however, that two diseases have been confounded, one in which fungus does exist, and another, which is more common, in which the disease consists of atrophy of the root of the hairs from some want of nutrition.

TREATMENT.—To treat dermatophytic diseases, we must pluck out the diseased hairs, and clean the patches by rubbing in soft soap, and then apply some parasiticide, as equal parts of sulphurous acid and glycerin, or one part of carbolic acid to three, four, or even ten parts of glycerin. The perchloride of mercury lotion recommended for pediculi is also very useful. When the patches are inflamed, soothing applications are best. In *tinea decalvans* stimulating applications are necessary.

Affections of the Glands.

We now come to consider the functional and structural affections of the glands of the skin. In many cases both the sebaceous and sudoriferous glands are simultaneously affected, as a result of some alteration in the relation existing between the blood and the excretory apparatus. At other times the causes are purely local.

Sweat-Glands.—The secretion of the sudoriferous glands may be altered in quantity and quality. Excessive sweating is called *hyperidrosis;* diminished sweating, *anidrosis.* If the mouth of the follicle is closed when the sweating is in excess, the acid liquid collects and distends the follicle, and gives rise to clear, pearly vesicles, known as *sudamina*, or *miliaria alba.* If the follicle be at the same time inflamed, the fluid will be less clear and alkaline, and there will be a halo of redness round the follicle; this is known as *miliaria rubra.* Sometimes the color of the sweat is altered to yellow or black, &c., but it must be confessed that the majority of these cases are probably impositions.

Sebaceous Glands.—When for any reason the secretion of the glands does not escape, but remains in the follicle, a little point, which soon becomes black, shows itself, and a *comedo* is said to exist. If this retained excretion irritate the wall and set up a slight amount of inflammatory redness, *acne punctata* is produced. But if, in addition to the redness, there is a considerable amount of inflammatory exudation and new growth forming hard masses, we have *acne indurata*, and when the points suppurate, *acne pustulosa.* When the acne nodules are accompanied by great vascularity from varicosity of the adjacent venules, and with a great increase of the surrounding connective tissue, it is called *acne rosacea.*

Acne is most common at the time of puberty, and seems to have some connection with the development of the sexual organs, but some, and especially those outside the profession, have made too much of this, and cruelly regard those suffering from acne to be the subjects of self-abuse. This is an opinion that must be warmly combated as likely to ruin many a good name. In young adults the disease is often met with associated with dyspepsia and terine disturbances, or as a result of exposure to heat, or from ant of proper cleanliness.

The favorite seats are the face, back, and shoulders, where the ebaceous glands are most active.

TREATMENT.—Improve general health; treat symptoms as they ccur; evacuate the follicles by frictions or pressure and stimu- ting applications. Sulphur ointment and soft soap are useful cally, and the application of a weak solution of perchloride of ercury is often followed by good results.

Molluscum Contagiosum.—In this disease there are numerous ttle pedunculated or sessile tumors on the skin, varying in size rom a pin's head to a large pea, or even a bean. On the summit ay be seen the depressed aperture of the follicle, the disease eing due to an enormous hypertrophy of the sebaceous glands, nd not to retention of secretion. The contagiousness of this dis- ase has been warmly disputed by some, but there can be no oubt that in some cases there is a remarkable history of con- agion. The writer has met with a case in which the trunk nd lower extremities became covered with hundreds of these umors, as the result of contagion from sexual intercourse with woman who had some of these molluscous tumors on the high.

TREATMENT.—When recent, the glands are readily squeezed ut bodily and the disease is then cured; but if they have existed ome time they require more force to bring them away, and then ften crumble under pressure. Some advise the application of itrate of silver to the wall of the gland after the contents have een evacuated, but this is rarely necessary.

Sycosis consists of an inflammation of the hair-follicles and se- aceous glands of the beard. The disease seems to commence in he tissue outside the follicles and gradually implicates the glands. There is considerable redness, swelling, and suppuration, and if he disease be neglected the glands will ulcerate out and produce thin, shining cicatrix, on which the hairs never grow again. The causes are various. Shaving with a dull razor, or the appli- ation of irritative washes, may produce it. The diseaee is re- markably obstinate and may last for years.

TREATMENT.—Cut the hair close and epilate early, but if suppuration have taken place scarify. By epilation the disease may at once be cured, or at least checked; and it is vain to hope for any good effects as long as the hair remains to prolong the irritation. Tonics and arsenic in some form will also be found useful in the later stages.

Xanthelasma or Vitiligoidea is due to an alteration of the epithelium lining the sebaceous follicles, accompanied by a fatty infiltration and the deposit of a light-colored pigment. It occurs in two forms, the *plane* and the *tuberous*, and presents itself in little yellow patches, especially about the upper eyelids, but it may be found on any part of the face, limbs, and palms. It is said never to occur in children, but a case was lately seen at University College Hospital, in which an acute general xanthelasma had shown itself in a young child one year old. Frequently, but by no means always, the disease is associated with some affection of the liver.

INDEX.

domen, diseases of the, 621
  physical examination of the, 621
dominal aneurism, 811
    symptoms, 811
    diagnosis, 813
    treatment, 813
  perforations and ruptures, 637
    symptoms, 638
    treatment, 638
  typhus, 152
normal conditions of the blood, 609
cess, 420
  renal, 841
orbent glands, diseases of the, 876
phalocyst, 768
dison's disease, 808
ynamic fever, 105
ue, 241
  symptoms, 241
  mode of invasion, 241
  description of a fit, 242
  condition of patient, 243
  temperature, 243
  urine, 243
  varieties, 244
  treatment, 244
bumen, tests for, 817
buminoid degeneration, 509
  infiltration, 98, 725
  liver, 767
  kidney, 857
coholic stimulants, 113
coholism, 940
  chronic, 943
terations in secretions, 102
veolar cancer, 306
ygdalitis, 330
yloid degeneration, 98
æmia, 36, 610
  symptoms, 611
  treatment, 612
  of the disk, 890
æsthesia, 915
asarca, 47
atomy and physiology, importance of, 17
gina pectoris, 540
  simplex, 327

Anidrosis, 1038
Arthritis deformans, 262
Aortic murmurs, 385
    obstruction, 562
    regurgitation, 563
Apepsia, 653
Apneumatosis, 478
Apnœa, 36
    signs of, 391
Apoplectic diseases, 963
    diagnosis, 996
    treatment, 1003
Apoplexy, sanguineous, 966
Aphthous stomatitis, 312
Arteries clinical phenomena connected with, 533
    fatty degeneration of, 598
    inflammation of, 596
Arteritis, 596
Articular rheumatism, 248
    chronic, 257
Ascites, 47, 639
    symptoms, 639
    physical signs, 640
    diagnosis, 640
    treatment, 642
Asthenia, 36
Asthenic fever, 105
    form of diphtheria, 223
Asthma, 473
    bronchial, 473
    spasmodic, 473
        symptoms, 474
        diagnosis, 475
        treatment, 476
    diaphragmatic, 477
Ataxic fever, 105
Atelectasis, 478
    symptoms, 480
    prognosis, 480
    treatment, 480
Atheroma, 596
Atonic dyspepsia, 656
Atrophy, 84
    of the disk, 891
    of the heart, 574
    of the liver, 765
    acute yellow, 764

Atrophy, chronic, 774
  progressive muscular, 1606
Auscultation, 354
  of the heart, 381

Bell's palsy, 902
Biliary calculi, 783
Blood, abnormal conditions of the, 609
Bloodvessels, diseases of, 596
Bloody flux, 710
Blue disease, 594
Brain and membranes, acute inflammations of the, 952
    adventitious growths in connection with, 981
    chronic diseases of the, 978
    organic diseases of the, 951
  cancer of the, 981
  hypertrophy of the, 985
  syphilitic disease of the, 981
Breakbone fever, 231
Breath-sounds, changes in, 368
Bright's disease, acute, 846
  chronic, 849
Bronchial asthma, 473
  catarrh, acute, 428
Bronchitis, acute catarrhal, 428
    symptoms, 429
    physical signs, 432
    diagnosis, 433
    prognosis, 433
    treatment, 434
  chronic, 436
    symptoms, 437
    physical signs, 438
    prognosis, 438
    treatment, 439
  mechanical, 432
  plastic or croupous, 440
  secondary, 432
Bronchocele, 881
Bronchorrhœa, 438
Bronchopneumonia, 452
Brow-ague, 910
Bullous inflammations, 1020

Cachexia, 117
Calcareous degeneration, 92
Calcification, 92
Cancer, 306
  anatomical characters, 306
  structure, &c., 307
  pathology, 309
  etiology, 309
  symptoms, 310
  of the intestines, 722
  of the liver, 772
  of the lungs, 507
  symptoms, 508
Cancer, physical signs, 508
  treatment, 509
  of the glands, 879
  of the stomach, 675
Cancerous growths, 772, 859
Cancroid, 307
Cancrum oris, 314
Carcinoma, 306
Cardiac affections, chronic, general diagnosis of, 579
  prognosis, 581
  treatment, 584
Cardiac affections, rare, 592
  aneurism, 593
  enlargement, causes of, 567
  impulse, 377
  percussion, 380
Cardiac thrombosis, 616
Carnification, 478
Case-taking, method of, 19
Catarrh, acute bronchial, 428
  chronic bronchial, 436
  enteric, 689
  epidemic, 400
  vesical, 865
Catarrhal inflammation, 72, 1018
  laryngitis, 407
  pharyngitis, 327
  stomatitis, 311
Causation of disease, 21
Causes of disease, classified, 23
Cephalalgia, 892
Cephalodynia, 259
Cerebral abscess, 960
  congestion or hyperæmia, 964
  diseases, chronic, treatment of, 1005
  embolism and thrombosis, 972
  symptoms, 976
  and meningeal hemorrhage, 966
  symptoms, 968
  softening, chronic, 980
  tumor, 981
Cerebritis, acute, 960
  treatment, 1003
Cerebro-spinal meningitis, epidemic, 1011
Cestodes, description of, 739
Chest, physical examination of, 349
  shape of, 356
Cheyne's symptom, 578
Chicken-pox, 212
Chloasma, 1036
Chlorosis, 610
Cholelithiasis, 783
Cholera, Asiatic, algid, or malignant, 695
    anatomical characters, 697
    symptoms, 698
    complications and sequelæ, 702
    varieties, 703
    pathology, 703

lera, Asiatic, diagnosis, 705
    prognosis, 705
  morbus, 695
lerine, 703
rea, 933
culatory organs, diseases of the, 530
rhosis of the liver, 774
  symptoms, 778
  physical signs, 779
  of lung, 454
rhotic kidney, 854
rgyman's sore throat, 417
ic, 657
loid cancer, 306
  degeneration, 97
na, 37, 895
nplications, 36
genital syphilis, 294
gestion, 42
  of the liver, 755
  of the spleen, 797
  renal, 839
stipation, 659
  symptoms, 659
  treatment, 660
ntagion, 118
  origin, modes of propagation, &c., 118
  degrees, 121
  effects, 124
  nature, 123
  prevention, 129
ntinued fevers, 138
nvulsions, 896
rd, adventitious growths in the, 991
  inflammation of the, 988
ugh, 392
up de soleil, 950
wpox, 206
  modes of vaccination, 206
  phenomena following, 208
  results, 210
  remote effects, 210
  treatment, 211
amp of the stomach, 647
epitant rhonchi, 372
oup, spasmodic, 423
  spurious, 423
    symptoms, 424
    diagnosis, 425
    treatment, 425
  true, 409
  membranous, 409
    diagnosis, 412
    treatment, 413
oupous inflammation, 72
  stomatitis, 312
anosis, 594
  symptoms, 595
  treatment, 596
nanche, 327
Cynanche laryngea, 407
  tonsillaris, 330
  trachealis, 409
Cystic disease, 861
Cystitis, 865

Dandy fever, 231
Degeneration, 86
  fatty, 87
  mineral, 92
  fibroid, 94
  mucoid, 97
  colloid, 97
  lardaceous disease, 98
Delirium, 894
  tremens, 941
Dengue, 231
  etiology, 231
  symptoms, 231
  treatment, 232
Derbyshire neck, 881
Dermatophytic affections of the skin, 1035
Dermatozoic affections of the skin, 1034
Descending optic neuritis, 890
Desquamative nephritis, acute, 846
  chronic, 852
Diabetes insipidus, 838
  mellitus, 831
    symptoms, 833
    diagnosis, 836
    treatment, 836
Diagnosis, 20
  questions to be considered in, 37
Diaphragmatic asthma, 477
Diarrhœa, 662
Diathetic diseases, 1029
Dietetic treatment, 41
Diffuse stomatitis, 311
Digitalis, effects of, on the heart, 586
Diphtheria, 220
  symptoms, 221
  forms of, 222
  complications, 223
  diagnosis, 225
  treatment, 225
  inflammatory form of, 222
Diphtheritic inflammation, 73
  stomatitis, 312
Disease, mode of invasion, course, &c., 35
Disk, ophthalmoscopic appearances of, 890
Disinfectants, 130
Distoma hepaticum, 749
Dorsodynia, 259
Dropsy, 47
  spurious, 48
  pathological conditions producing, 48

Dropsy, causes, 50
  symptoms, 51
  diagnosis, 52
  origin, seat, and extent, 52
  prognosis, 53
  treatment, 53
  operation for, 56
  of the peritoneum, 639
  of the pleura, 520
Dropsical fluid, 48
Dysentery, 710
  symptoms, 713
  diagnosis, 716
  prognosis, 716
  treatment, 717
Dyspepsia, 653
  symptoms, 654
  varieties, 655
Dyspnœa, 390
Duodenitis, 689

Echinococcus hominis, 768
Eclampsia, 896
Ecthyma, 1024
Eczema, 1018
Elimination of contagious poisons, 125
Emboli, origin of, and anatomical characters resulting from, 620
Embolism, 615, 620
  cerebral, 972
  renal, 841
Emphysema, interstitial or interlobular, 472
  vesicular, 463
  anatomical characters, 466
  symptoms, 469
  physical signs, 470
  prognosis, 471
  treatment, 471
Empyæma, 511
Encephaloid, 507
  cancer, 306
Enchondromatous tumors, 509
Endemic disease, 126
Endocardial murmurs, 383
Endocarditis, acute, 555
  symptoms, 556
  physical signs, 557
  diagnosis, 557
  treatment, 557
Enlargements of the abdomen, 625
Enteralgia, 657
  treatment, 658
Enteric catarrh, 689
  fever, 152
Enteritis, 689
Epidemics, 126
  laws of, 127
  progress, mode, intensity, duration, &c., 128
Epidemic catarrh, 400
Epilepsy, 926
  symptoms, 927
  stages of attack, 928
  diagnosis, 930
  treatment, 931
  gravior, 927
  mitior, 927
Epistaxis, 57
Epithelioma, epithelial cancer, 307
Equinia, 228
  mitis, 231
Erysipelas, 213
  causes, 214
  symptoms, 215
  varieties, 217
  diagnosis, 218
  treatment, 219
Erythema, 1016
Erythematous inflammations, the, 1015
  stomatitis, 311
Etiology, explanation of, 21
  value of, 22
Excretory elimination, 109
Exophthalmic goitre, 882
Extrinsic causes of disease, 23
Exudation, 67

Facial paralysis, 902
Falling sickness, 926
Famine fever, 169
Farcy, 228
Fatty degeneration, 87, 576
    effects of, 89
    causes, 90, 576
    anatomical characters, 577
    symptoms, 577
    physical signs, 579
    termination, 579
    of arteries, 598
  disease of the heart, 575
  infiltration, 575
  kidney, 857
  liver, 766
Febricula, 138
  symptoms, 139
  duration, 139
  diagnosis, 139
  treatment, 140
Febrile cases, clinical investigation of acute, 132
Fermentation-test, 820
Fever, 101
  phenomena and symptoms, 101
  modes of termination, 103
  types, 104
  pathology, 107
  prognosis, 110
  treatment, 110
Fibroma, 1032

Fibroid degeneration, 94, 454
    phthisis, 454
Follicular pharyngitis, 330
    stomatitis, 312
Fomites, 120
Fremitus, 362
Friction-sounds, 387
Fungous stomatitis, 313

Gall-bladder, affections of the, 781
Gallstones, 787
    anatomical characters, 784
    symptoms, 785
Galloping consumption, 487
Gangrene, 71
    of the lung, 461
Gangrenous stomatitis, 314
Gastralgia, 646
Gastric affections, chronic, general diagnosis of, 680
        general prognosis, 683
        general treatment, 684
        catarrh, acute, 665
        anatomical characters, 665
        symptoms, 666
        diagnosis, 667
        treatment, 667
Gastritis, acute, 665
        chronic, 669
        etiology, 669
        anatomical characters, 669
        symptoms, 670
Gastrodynia, 646
Gelatiniform cancer, 306
General diseases, 117
    history, necessary, 21
    paralysis, 899
Germ theory, 123
Giddiness, 893
Gingivitis ulcerosa, 312
Glanders and farcy, 228
    symptoms, 229
    diagnosis, 231
    treatment, 231
Glands of skin, affections of, 1038
        special diseases of, 877
        diagnosis, 880
        prognosis, 880
        treatment, 880
Glossitis, 318
Glosso-laryngeal paralysis, 1013
Glottis, spasm of the, 423
Glycosuria, 831
Goitre, 881
    exophthalmic, 882
Gonorrhœal rheumatism, 261
Gout, 264
    acute, 266
    chronic, 268
    retrocedent, 269
Gout, diagnosis, 270
    treatment, 272
Gravel, 863
Great vessels, malformation of the, 594

Hæmatemesis, 57, 651
    symptoms, 652
    diagnosis, 652
    treatment, 653
Hæmatinuria, 826
Hæmatoma, 509
Hæmaturia, 57, 824
Hæmophilia, 59
Hæmoptysis, 57, 393
Hæmothorax — hemorrhage into the pleura, 521
    treatment, 521
Hassall's test, 820
Haut mal, 927
Headache, 892
Head symptoms, 892
Health temperature, 135
Heart, the acute inflammation of, 548
    atrophy of, 574
    chronic affections of, 558
    clinical phenomena connected with, 530
    degeneration and new formations in the walls of, 593
    enlargements of the, 566
        etiology, 567
        symptoms, 571
        physical signs, 572
    malformation of the, 594
    fatty disease of, 575
    rupture of the, 593
Hectic type of fever, 106
Helminthiasis, 737
Hemicrania, 910
Hemiplegia, 900
Hemorrhage, 57, 457
    pathological conditions giving rise to, 57
    post-mortem appearance, 59
    symptoms, 60
    diagnosis, 61
    treatment, 61
    prognosis, 61
    cerebral and meningeal, 966
    traumatic, 58
Hemorrhagic infarct, 58
    infarction, 798
Hepar adiposum, 766
Hepatalgia, 748
Hepatic abscess, 757
Hepatic tumors, characters of, 748
Hereditary disease, 25
Herpes, 1020
Hip-gout, 912
Hooping-cough, 395

Hooping-cough, complications and sequelæ, 397
  diagnosis, 398
  treatment, 398
Hydatids, 509
Hydatid tumor of the liver, 768
  anatomical characters, 768
  symptoms, 771
Hydrocephalus, 47
  acute, 956
  chronic, 984
Hydronephrosis, 862
Hydropericardium, 47
Hydropneumothorax, 521
Hydrophobia, 937
Hydrothorax, 47, 520
Hygienic treatment, 40
  of contagious diseases, 129
Hypæsthesia, 915
Hyperæmia, active, 42
  passive, 45
  cerebral, 964
  of the liver, 755
  of the spleen, 797
  renal, 839
Hyperidrosis, 1038
Hypertrophy, 82
  effects, 82
  causes, 83
  of the heart, 566
  of the liver, 765
  of the spleen, 799
Hypochondriasis, 924
Hysteria, &c., 916
  symptoms, 918
  characters of fit, 918
  state in intervals, 919
  diagnosis, 923
  treatment, 923

Ichthyosis, 1031
Icterus, 748
Idiopathic fevers, 117
Idiosyncrasy, 24
Impetigo contagiosa, 1023
Indigestion, 653
Induration of the cord, 989
  with dilated bronchi, 454
Infantile paralysis, 1010
Infarction, 841
Infection, 120
Infiltration, fatty, 90
Inflammation, 63
  changes in inflamed tissue, 63
  changes in bloodvessels, 63
  changes in affected tissue, 65
  origin of, 66
  products, 67
  induration, 70
  symptoms, 73
Inflammation, causes, 75
  varieties, 77
  treatment, 77
  of the bile-ducts, 761
  circumscribed or suppurative, 757
    anatomical characters, 758
    symptoms, 759
  of the intestines, 689
    symptoms, 691
    diagnosis, 693
    treatment, 694
  of the pelvis of the kidney, 842
  of the pleura, 510
Inflammations of the heart, &c., acute, 548
Inflammatory diseases, acute, general diagnosis of, 995
Influenza, 400
  anatomical characters, 400
  symptoms, 401
  diagnosis, 402
  treatment, 403
Inorganic murmurs, 386
Insensibility, 895
Insidious diphtheria, 222
Insolation, 950
Intercostal neuralgia, 912
Intermittent fever, 241
  type of fever, 104
Interstitial nephritis, chronic, 854
  pathology, 855
  symptoms, 856
Intestines, cancer of the, 722
  diseases of the, 643
  perforation of the, 157
  large, in typhoid fever, 157
  scrofulous diseases of, 723
  tubercle of the, 723
Intestinal catarrh, 689
  hemorrhage, 664
  new formations and ulcerations, 720
  obstruction, 726
    anatomical characters, 729
    symptoms, 731
    diagnosis, 731
    treatment, 735
  worms, 737
    symptoms, 741
    prognosis, 743
    treatment, 743
Intracardiac blood concretions, 616
Intrinsic causes of disease, 23
Irritative dyspepsia, 657
Ischæmia of the disk, 890

Jaundice, 748
  anatomical characters, 750
  symptoms, 751
  diagnosis, 753

- Jaundice, prognosis, 753
  - treatment, 754

- Keloid, 1031
- Kidney, dropsy of the, 862
  - granular contracted, 854
  - lardaceous, 857
  - large, white, smooth, 852
  - suppurative inflammation of the, 841
    - anatomical characters, 841
    - symptoms, 842

- Lardaceous disease, 98
    - characters, 98
    - origin, 99
    - organs affected, 99
    - causes, 100
    - symptoms, 100
    - of the glands, 879
  - kidney, 857
- Laryngeal catarrh, 407
  - diseases, organic, general diagnosis, &c., of chronic, 421
  - paralysis, 426
    - varieties, 426
    - diagnosis, 427
    - treatment, 427
  - perichondritis, 420
- Laryngismus stridulus, 423
- Laryngitis, acute, 407
  - chronic, 416
  - croupous or plastic, 409
  - mucous, 407
  - œdematous, 407
- Laryngoscope, uses of, 405
- Larynx, affections of, 404
  - functional or nervous affections of the, 423
  - morbid growths in the, 419
  - necrosis of the cartilages of, 420
  - ulcers of the, 418
- Lead-poisoning, 947
- Leucocytes, 64
- Leucocythæmia, 799
- Lichen, 1025
- Liquor puris, 69
- Liver, acute inflammatory affections of the, 757
  - affections, chronic, general diagnosis of, 787
    - general prognosis, 790
    - general treatment, 791
  - and appendages, diseases of, 747
  - chronic diseases of the, 765
  - cirrhosis of, 774
  - congestion of the, 755
  - -fluke, 749
  - hydatid tumor of the, 768
- Liver, lardaceous, 767
- Local diseases, 118, 310
- Lock-jaw, 939
- Locomotor ataxy, 992
- Lumbago, 260
- Lung, gangrene of the, 461
- Lungs, cancer of, 507
  - cirrhosis of, 454
  - diseases of, 427
  - emphysema of, 463
  - inflammation of, 441
  - and pleuræ, general diagnosis of affections of the, 524
  - rare formations in, 509
- Lupus, 1032
- Lymph, 68
- Lysis, 103

- Maculæ, 144
- Malaria or marsh-miasm, 239
  - origin, propagation, and modifying influences, 239
  - nature, 240
  - mode of entrance, 240
  - preventive treatment, 241
- Malignant type of fever, 106
- Measles, 185
  - symptoms, 186
  - varieties, 188
  - complications and sequelæ, 189
  - diagnosis, 189
  - prognosis, 189
  - treatment, 190
  - and scarlatina, hybrid of, 191
- Mediastinal tumors, 607
  - diagnosis, 608
  - treatment, 609
- Mediate percussion, 623
- Medullary cancer, 306
- Melæna, 57, 664
- Melanæmia, 96
- Melanotic cancer, 508
- Meningitis, acute, simple, or primary, 952
    - symptoms, 953
    - treatment, 1003
  - chronic, 978
  - rheumatic, 960
  - tubercular, 956
- Menorrhagia, 57
- Mensuration of chest, 352
- Mercurial stomatitis, 315
  - tremors, 949
- Metamorphosis, 576
  - fatty, 87
    - causes, 90
    - effects, 89
- Miasmatic diseases, 126
- Micrococci, 123
- Microzoaires, 124

Microzymes, 123
Migraine or megrim, 910
Miliary tubercle, 299
Mineral degeneration, 92
Mitral murmurs, 385
  obstruction, 562
  regurgitation, 561
Mixed types of kidney diseases, 858
Molluscum contagiosum, 1039
Moore's test, 820
Morbid conditions of the spleen, 802
Morbilli, 185
Mortification, 71
Mouth and tongue, affections of, 311
Mucin, 69
Mucoid degeneration, 97
Mucous laryngitis, 407
  membrane relaxed, 338
Mulberry rash, 144
Mumps, 321
Muscular and tendinous rheumatism, 258
Muscular atrophy, progressive, 1006
Myalgia, 258
  symptoms, 258
  varieties, 259
  treatment, 260
Myelitis, acute, 988
  chronic, 989
Myeloid tumors, 509
Myocarditis, acute, 558

Nasal diphtheria, 223
Necrosis of the cartilages of larynx, 420
Nematodes, characters of, 740
Nephritis, desquamative, acute, 846
   chronic, 852
  interstitial, chronic, 854
  suppurative, 841
Nervous diseases, organic, general diagnosis of, 994
   general prognosis, 1002
   general treatment, 1003
  dyspepsia, 657
  system, diseases of the, 884
Neuralgia, 907
  symptoms, 909
  varieties, 910
  treatment, 913
Neuritis, chronic optic, 891
New formations, intestinal; 720
Noma, 314

Œdema, 47, 457
  of the disk, 890
  glottidis, 423
Œdematous laryngitis, 407
Œsophagus, affections of, 341
  chronic affections of, 343
Œsophagus, functional derangements, 433
  organic diseases, 344
  general diagnosis, 347
  treatment, 348
Œsophagismus, 343
Œsophagitis, acute, 342
Omodynia, 259
Optic neuritis, chronic, 891
Osteoid tumors, 509

Pain, points to ascertain about, 35
Palpation, 352
Palpitation, 544
  exciting causes, 544
  symptoms, 546
  diagnosis, 547
  treatment, 547
Palsy, muscular, 899
Pancreas, diseases of the, 804
  special affections of the, 805
Pancreatitis, 805
Pandemic wave, 128
Papillary stomatitis, 312
Paralysis agitans, 1009
  facial, 902
  general, 899
  glosso-laryngeal, 1013
  in connection with the eye, 903
  laryngeal, 426
  muscular, 899
  of a part, treatment of, 905
  of children, essential, 1010
  sensory, 915
  uses of electricity in, 906
Paraplegia, 901
Parasitic growths, 860
  stomatitis, 313
Parenchymatous inflammation, 318
Parotid bubo, 323
Parotitis, 321
Passive hyperæmia, 45
Pemphigus, 1022
Percussion, 353
  sounds of, 363
Perforation of intestines, 157
Pericardial hemorrhage, 592
  murmurs, 387
Pericarditis, acute, 548
  symptoms, 549
  physical signs, 551
  diagnosis, 552
  termination, 553
  treatment, 553
Pericardium, acute inflammations of, 548
  adherent, 559
  chronic affections of the, 558
  clinical phenomena connected with the, 530
Perihepatitis, 761

inephritis, 845
ineuritis, 891
itoneum, diseases of the, 627
dropsy of the, 639
morbid growths in the, 636
itonitis, acute, 627
anatomical characters, 628
symptoms, 629
diagnosis, 631
prognosis, 632
treatment, 632
chronic, 634
treatment, 636
ityphlitis, 689
tussis, 395
tis, 232
it mal, 927
rifaction, 92
er's patches, 155
ryngea, 327
ryngitis, follicular, 330
rynx, paralysis of the, 905
legmasia dolens, 618
symptoms, 619
effects, 619
treatment, 619
hiriasis, 1034
hisis, 481
etiology, 481
pathology, 484
acute, 487
treatment, 488
chronic, 488
symptoms, 491
physical signs, 495
varieties, 497
diagnosis, 499
prognosis, 499
treatment, 501
fibroid, 454
ysical examination explained, 34
of the chest, 349
mentary degeneration, 94
yriasis rubra, 1028
simplex, 1028
gue, 232
ques molles, 155
dures, 155
stic and papular inflammation of the
kin, 1025
ura, dropsy of the, 520
hemorrhage into the, 521
uræ, diseases of, 427
general diagnosis of affections of, 524
table, 526, 527
urisy, 510
anatomical characters, 510
symptoms, 512
physical signs, 514
diagnosis, 516
Pleurisy, treatment, 517
Pleurodynia, 259
Pneumonia, 441
acute croupous, 441
anatomical characters, 443
symptoms, 444
physical signs, 447
termination and duration, 448
prognosis, 449
diagnosis, 449
treatment, 449
catarrhal, 452
pathological and anatomical characters, 452
symptoms, 453
treatment, 454
chronic or interstitial, 454
disseminated or lobular, 452
lobar, 441
Pneumopericardium, 592
Pneumothorax, 521
physical signs, 523
treatment, 524
Podagra, 264
Primary laryngeal form of diphtheria, 223
Prognosis, 38
Prosopalgia, 910
Prurigo, 1026
Psoriasis, 1027
Ptyalism, 324
Pulmonary artery and branches, thrombosis in the, 617
collapse, 478
compression, 478
Pulmonary congestion, 457
symptoms, 460
physical signs, 460
prognosis, 461
treatment, 461
consumption, 481
disease, 566
Pulmonary sounds, 363
artery murmurs, 386
Pus, 69
Pyæmia, 613
Pyelitis, 842
symptoms, 844
Pyloric obstruction, 678
Pyonephrosis, 842
Pyrexia, 101
Pythogenic fever, 152

Questioning of patients necessary, 34
Quinsy, 330

Rabies, 937
Rachitis, rickets, 283
etiology, 283

Rachitis, anatomical characters, 284
  symptoms, 286
  treatment, 289
Râles, 370
  classification of, 371
Red softening, 891
Relapsing fever, 169
    symptoms, 169
    relapse, 172
    temperature, 172
    complications and sequelæ, 172
    diagnosis, 172
    distinctions from typhus, 173
    terminations, 173
    treatment, 174
  type of fever, 104
Remittent fever, 246
  type of fever, 104
Renal abscess, 841
  casts, 827
  congestion, 839
  embolism, 841
  tumors, 828
Respiration, movements of, 359
  sounds of, 367
Respiratory organs, diseases of the, 390
Retinitis, 891
Retrocedent gout, 269
Rheumatic fever, 248
  causes, 249
  anatomical characters, 249
  symptoms, 249
  complications, 251
  diagnosis, 252
  treatment, 253
Rheumatic meningitis, 960
Rheumatism, 248
  gonorrhœal, 261
  muscular, 258
Rheumatoid arthritis, 262
Rhonchi, 370
Ringworm, 1036
Rose, the, 213
Roseola, 1017
Rötheln, 191
Rubeola, 185

St. Anthony's fire, 213
St. Vitus's dance, 933
Salivary glands, affections of, 321
Salivation, 324
Sanguineous apoplexy, 966
Sarcomatous tumors, 509
Saturnism, 947
  treatment, 949
Scabies, 1034
Scapulodynia, 259
Scarlatina, 175
Scarlet fever, 175
  symptoms, 176
Scarlet fever, eruptive stage, 177
  state of throat, 177
  desquamative stage, 178
  varieties, 179
  complications and sequelæ, 181
  diagnosis, 182
  prognosis, 183
  treatment, 183
Sciatica, 912
Scirrhus cancer, 306
Scorbutus, scurvy, 275
  anatomical characters, 276
  symptoms, 276
  diagnosis, 278
  treatment, 278
  varieties, 282
Scrivener's palsy, 1008
Scrofulosis, 298
Scrofulous disease of the glands, 878
  of the intestines, 723
Sebaceous glands, 1038
Semeiology, 31
Sensory paralysis, 915
Septicæmia, 613
Sequelæ, 36
Serum, 67
Shaking palsy, 1009
Sick-headache, 910
Signs of cavities in lung, 496
Skin, diseases of the, 1014
  new formations of the, 1032
  papular inflammation of the, 1025
  pigmentary changes of the, 1033
  parasitic diseases of the, 1034
Small-pox, 191
  anatomical characters, 192
  symptoms, 193
  eruption, 194
  secondary fever, 196
  varieties, 196
  inoculated, 199
  complications and sequelæ, 200
  diagnosis, 200
  prognosis, 201
  treatment, 202
Soft cancer, 306
Softening of the brain, 972
  acute, 967
Spanæmia, 610
Spasm of the glottis, 423
Spasmodic asthma, 473
Special causes of disease, 30
  valvular diseases, 560
Sphygmograph, description of the, 537
Sphygmographic tracing, a, 537, 538
Spinal cord and membranes, diseases of
    the, 986
  diseases, treatment of, 1005
  congestion, 990
  hemorrhage, 991
  meningitis, acute, 986

nal meningitis, chronic, 987
een, diseases of the, 796
  hypertrophy of the, 799
  other morbid conditions of the, 802
enitis, 798
oradic diseases, 126
amous diseases, 1027
  inflammations, 1027
mach, cancer of the, 675
  symptoms, 676
  and intestines, diseases of the, 643
  spasm or cramp of the, 647
  ulcer of the, 671
matitis, 311
  forms of, 311–315
por, 895
bcuticular mottling, 144
bmucous laryngitis, 407
cussion, 376
ffocative breast-pang. 540
gar, tests for, 819
nstroke, 950
ppuration, 69
ppurative inflammation, 1023
  nephritis, 841
prarenal capsules, diseases of the, 808
eat-glands, 1038
cosis, 1039
mptomatology, 31
mptomatic parotitis, 323
mptoms, mode of examination for, 32
ncope, 542
  treatment, 544
philis, acquired, 1029
  congenital, 294
  constitutional, 291
    diagnosis. 296
    treatment, 297
  hereditary, 1029
philitic disease, 780
stemic veins, thrombosis in the, 618

peworms, description of, 739
rminations of disease, 36
tanus, 939
ermometer, use of, 133
  mode of use, 134
oracic aneurisms, 600
  symptoms, 601
  physical signs, 602
  modes of termination, 603
  diagnosis, 603
  treatment, 605
orax, divisions of, 350
  lines, 350
  regions, 351
roat, affections of, 325
rombosis, 615
  arterial, 976
  cerebral, 972
Thrombosis, in the pulmonary artery 617
  in the systemic veins, 618
Thrush, 313
Thyroid glands, diseases of the, 881
Tic-douloureux, 910
Tinea tonsurans, 1035
  circinata, 1036
  sycosis, 1036
  versicolor, 1036
  favosa, 1036
  decalvans, 1037
Tongue, paralysis of the, 904
Tonsillitis, acute, 330
  course, &c., 332
  treatment, 332
Torticollis, 259
Trachea, affections of the, 404
Tracheal sounds, 363
Traumatic hemorrhage, 58
Treatment, 39
  therapeutic, 40
Trichinosis, 745
Tricuspid murmurs, 386
  obstructions, 566
  regurgitation, 565
Tubal nephritis, acute, 846
  chronic, 852
Tubercle, 860
  of the brain, 981
  of the intestines, 723
Tubercular disease of the glands, 878
  meningitis, 956
  ulceration of the intestines, 723
Tuberculosis, 298
    pathology, 301
    etiology, 302
    symptoms, 304
    diagnosis, 305
    treatment, 305
  of the liver, 780
Tussive resonance, 376
Tympanitic sounds, 363
Typhlitis, 689
Typhoid fever, 152
  predisposing causes, 153
  anatomical characters, 154
  stages of softening of ulcer, 155
  of cicatrization, 156
  symptoms, 159
  varieties, 163
  complications and sequelæ, 164
  diagnosis, 164
  duration, 165
  treatment, 166
Typhus fever, 140
  anatomical characters, 141
  eruptive stage, 143
  course, 144
  state of defervescence, 146
  varieties, 147

Typhus fever, sequelæ, 147
  diagnosis, 148
  diseases with which confounded, 148
  duration, 148
  treatment, 149

Ulceration, 71
Ulcerations, intestinal, 720
Ulcer of the stomach, 671
Ulcers of the mouth and tongue, 320
  of the throat, 334
Uræmia, 829
Urea, test for, 816
Uric acid, 817
Urinary affections, general diagnosis of, 866
  general prognosis, 869
  general treatment, 871
  calculus, 863
  deposits, 821
  organs, diseases of the, 814
Urine, examination of the, 34, 815
  microscopical examination of the, 821
Urticaria, 1017

Vaccina, 206
Vaccination, 206
Valves and orifices of heart, affections of the, 559
Varicella, 212
Variola, 191
Varioloid, 199
Veins, clinical phenomena connected with the, 540
Venous hyperæmia, 44
Vertigo, 893
Vesical catarrh, 865
Vesicular emphysema, 463
Virus, 123
Vitiligoidea, 1040
Vocal resonance, 374
Vomiting, 648
  treatment, 650

Wasting palsy, 1006
Water canker, 314
Waxy disease, 98
  liver, 767
White mouth, 313
  softening of brain, 989
Whooping-cough, *see* Hooping-cough.
Writer's cramp, 1008

Xanthelasma, 1040
Xeroderma, 1031

Yellow fever, 234
  anatomical characters, 235
  symptoms, 235
  groups, 237
  diagnosis, 238
  treatment, 238
  tubercle, 299

Zyme, 123
Zymotic disease, 126

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